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AND

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AN old ghost is again reappearing among us in the shape of a bisulphide of carbon engine. Its persistency is only equaled by the regularity with which it collapses after a brief period of "success," which is generally, however, long enough to transfer a notable sum of hard cash from the pockets of the credulous to those of skillful promoters and enthusiastic inventors.

A CLEVER swindler, named SHERMAN, has been trying to victimize a number of influential people by endeavoring to interest them in an alleged invention. He claimed to be able to produce an alloy resembling tin by simply melting iron slag. His tricks were first publicly denounced by Messrs. TORREY & EATON, of this city, an announcement which was quickly followed by discovering how actively the "inventor" had been at work during the past few months—and not without success. SHERMAN induced his victims to be present at a test, bringing their own "iron slag." He added to the charge a small quantity of a powder, and, after half an hour's melting, was able to astonish them with a lump of "alloy." It is thought probable that the "inventor" skillfully substituted for the "iron slag" oxide of tin, which closely resembles it in color, because the quantity of "flux" he added was not sufficient to account for the amount of metal produced.

A PROTEST signed by the leading iron and steel manufacturers and iron ore producers has been made against the enactment of the Morrison tariff bill. The Ways and Means Committee has adopted that measure in such a form that it provides for a reduction of 15 per cent from existing duties on the metal schedule, with the exception of iron and steel sheets, or plates, or taggers iron coated with tin or lead, or with a mixture of which these metals is a compound part, by the dipping or any known process, and commercially known as tin plates, terne plates, and taggers tin, on which the reduction shall be 20 per cent. An agreement has been reached concerning the placing of coal on the free list, by which the clause is so amended that it shall not apply to coal imported from the Dominion of Canada until that government shall have exempted from the payment of duty all coal imported into that country from the United States.

## OUR IMPORTS AND EXPORTS IN 1883.

The Bureau of Statistics has just issued its report of the imports and exports for the year 1883. A study of the figures submitted reveals many facts worthy of interest. Turning first to the imports of iron and steel, we have:

IMPORTS OF IRON AND STEEL IN 1883 AND 1882.

| Articles. | Quantities. 1883. | Quantities. 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Iron ore, tons | 490,875 | 589,655 | $1,207,991 | $1,640,564 |
| Pig-iron, " | 322,648 | 540,159 | 5,745,999 | 9,896,669 |
| Scrap-iron, " | 64,286 | 146,956 | 1,014,863 | 2,736,483 |
| Bar-iron, net tons | 47,409 | 79,220 | 1,917,470 | 3,304,967 |
| Iron rails, gross tons | 676 | 37,447 | 21,231 | 1,077,059 |
| Steel rails, " " | 34,125 | 162,620 | 1,047,609 | 5,403,980 |
| Hoop, band, and scroll iron, net tons | 1,005 | 6,021 | 39,436 | 208,825 |
| Sheet, plate, and togger's iron, " " | 10,155 | 13,160 | 765,274 | 806,648 |
| Tin plates, " " | 246,690 | 239,665 | 18,075,814 | 17,975,161 |
| Cutlery | | | 2,061,603 | 2,027,496 |
| Fire-arms | | | 1,258,940 | 1,656,349 |
| Machinery | | | 1,685,370 | 2,275,753 |
| Cotton ties, steel hoops, sheets, plates, ingots, bars, wire rods, wire, wire rope, anvils, axles, forgings, chains, files, and needles | | | 13,875,693 | 19,705,735 |

The Bureau of Statistics, we are pleased to note, is beginning to enter more into detail; thus the reports of the latest months specify the quantity and value of wrought and steel scrap, cotton ties, sheet and hoop steel, steel ingots and billets, wire rods, wire and wire rope.

A glance at the figures given above shows, as expected, a general decline both in the values and quantities of our imports, with the exception of tin plates; and if the depression in business were not equally if not more intense abroad, we should be able to record even a more striking falling off.

The exports of foreign iron and steel are generally too small to be worthy of notice, the only particularly striking figure being that referring to steel rails, of which 24,805 gross tons in 1883, and 32,070 tons in 1882, valued at $688,710 and $941,534 respectively, merely passed through this country to their destination elsewhere. We believe the bulk of these rails were for the Canada Pacific. This makes the actual quantity of steel rails entered for consumption here in 1883 about 10,000 tons only.

Our exports of iron and steel and manufactures thereof are not as heavy as they should be, though they are greater than is generally believed. The following are the principal figures:

EXPORTS OF DOMESTIC IRON AND STEEL.

| Articles. | Quantities. 1883. | Quantities. 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Iron ore, tons | 2,753 | 4,329 | $10,692 | $22,337 |
| Pig-iron " | 3,769 | 5,576 | 111,414 | 186,221 |
| Car-wheels, number | 18,217 | 14,370 | 181,236 | 149,320 |
| Castings, n. e. s. | | | 385,262 | 378,884 |
| Cutlery | | | 103,732 | 91,994 |
| Fire-arms | | | 1,357,686 | 927,180 |
| Machinery | | | 5,935,543 | 6,129,244 |
| Nails and spikes, net tons | 5,724 | 4,053 | 388,070 | 329,753 |
| Printing-presses | | | 250,407 | 215,619 |
| Iron and steel rails | 2,308 | 3,221 | 134,670 | 208,228 |
| Saws and tools | | | 1,388,562 | 1,065,242 |
| Scales and balances | | | 319,041 | 315,898 |
| Sewing-machines | | | 3,362,971 | 2,975,616 |
| Locomotives, number | 275 | 174 | 2,650,944 | 1,878,528 |
| Stationary engines, number | 147 | 104 | 170,104 | 183,211 |
| Boilers and parts of engines | | | 290,177 | 189,413 |
| Stoves and ranges | | | 232,713 | 213,158 |
| All other manufactures of iron and steel | | | 5,453,851 | 7,135,744 |

Turning to the metals, we have the following exhibit of imports, after deducting from the figures of the imports the amounts returned as re-exports of foreign merchandise:

NET IMPORTS OF METALS IN 1882 AND 1883.

| Articles. | Quantities. 1883. | Quantities. 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Platinum, unmanufactured, pounds | 3,196 | 3,072 | $316,988 | $295,820 |
| Tin, net tons | 10,663 | 10,447 | 4,829,126 | 5,055,997 |
| Brass and manufactures of | | | 493,288 | 692,684 |
| Copper ore | | | 65,567 | 110,576 |
| Ingot, old, etc., pounds | 441,734 | 475,452 | 48,240 | 55,210 |
| All other manufactures of copper | | | 242,714 | 286,095 |
| Lead and manufactures | | | 84,583 | 187,006 |
| Metals, metal compositions, and manufactures in United States | | | 1,959,324 | 2,026,206 |
| Spelter, net tons | 4,348 | 12,826 | 319,890 | 1,024,324 |
| Manufactures of zinc | | | 75,429 | 215,210 |

EXPORTS OF METALS IN 1882 AND 1883.

| Articles. | Quantities. 1883. | Quantities. 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Brass, and manufactures of | | | $237,187 | $265,590 |
| Clocks, and parts of | | | 1,274,946 | 1,457,227 |
| Copper ore, tons | 12,253 | 2,204 | 1,971,581 | 179,837 |
| Ingot, pounds | 18,206,187 | 2,999,671 | 2,784,816 | 534,449 |
| All other manufactures of copper | | | 126,208 | 112,246 |
| Lead and manufactures | | | 77,538 | 50,367 |
| Gold and silver ore | | | 383,740 | 8,290 |
| Quicksilver, pounds | 2,416,663 | 2,627,425 | 861,916 | 1,004,394 |
| Ore and oxide of zinc | 105 | 191 | 9,292 | 14,477 |
| Pig, bar, and sheet-zinc, net tons | 63 | 560 | 8,616 | 98,008 |

We have therefore imported less, and on the whole exported more in

1883 than in 1882. The falling off in supplies from foreign sources is most marked in the case of spelter, while the greatest increase in exports is in copper ore and ingot. The ore of course includes mattes.

From the miscellaneous list, we cull the following data, including the imports of chemicals. On some materials, like asphaltum, muriate of potash, the Bureau of Statistics has just begun to print special returns:

IMPORTS OF CHEMICALS, ETC

| Articles. | Quantities 1883. | Quantities 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Chloride of lime, net tons | 51,674 | 46,810 | $1,950,838 | $847,564 |
| Nitrate of soda, " " | 64,167 | 75,149 | 2,469,013 | 3,045,127 |
| Brimstone, gross tons | 100,092 | 101,595 | 2,177,242 | 2,674,449 |
| Phosphates, " " | 43,589 | 42,344 | 424,343 | 414,932 |
| Plaster of Paris, " " | 169,582 | 151,353 | 170,003 | 152,653 |
| Cement, barrels | 539,810 | 483,689 | 788,147 | 878,186 |
| Saltpeter, crude, net tons | 5,942 | 5,225 | 395,443 | 391,532 |
| Bicarbonate of soda, " " | 1,109 | 1,058 | 66,442 | 53,535 |
| Carbonate soda, sal soda, soda ash, net tons | 163,761 | 115,694 | 3,931,278 | 4,010,237 |
| Caustic soda, net tons | 32,797 | 30,401 | 1,436,450 | 1,336,497 |
| Clays and kaolin, gross tons | 23,463 | 27,296 | 200,680 | 267,535 |
| Bituminous coal, " " | 752,817 | 774,425 | 2,240,260 | 2,114,361 |
| Salt, net tons | 502,085 | 409,571 | 1,786,821 | 1,614,268 |
| Plumbazo | 9,058 | 7,040 | 411,532 | 326,536 |

EXPORTS OF MISCELLANEOUS ARTICLES.

| Articles. | Quantities. 1883. | Quantities. 1882. | Values. 1883. | Values. 1882. |
|---|---|---|---|---|
| Anthracite, gross tons | 652,814 | 531,836 | $3,693,249 | $2,476,568 |
| Bituminous coal, " " | 609,892 | 413,171 | 1,992,461 | 1,418,379 |
| Gunpowder, net tons | 1,362 | 1,383 | 413,217 | 472,921 |
| Lime and cement, barrels | 73,781 | 70,439 | 123,073 | 105,090 |
| Salt, net tons | 1,412 | 1,412 | 20,172 | 17,086 |

So far as coal is concerned, there has been an increase in the exports and a decline in the imports. Chemicals show, on the whole, a tendency to increase in quantity, while values have fallen off.

## OFFICIAL STATEMENTS AND REPORTS.

### THE BASSICK MINING COMPANY, COLORADO.

This company, of which Frank G. Brown is president and W. T. Van Pelt treasurer, has issued a brief financial statement showing how the property flourished in the year 1883. The receipts from sales of ore were $654,175.84, of which $397,727.76 were realized from the sale of 374 tons of selected ore, running $1064 per ton, and $256,448.08 were obtained from marketing 1287 tons of headings from putting through the concentrator 14,812 tons of ore. The expenditures for labor and supplies at the mill were $43,881.64, or $2.96 per ton of ore treated. The cost of fuel is not included in this, the outlay being $30,738.19 for cord-wood and $2156.02 for coal. The following is a recapitulation of the receipts and expenditures during the year:

| | | |
|---|---|---|
| Receipts from sales of ore for year 1883 | $654,175.84 | |
| " " interest on loans for year 1883 | 4,179.05 | $658,354.89 |
| Expenses at mine, year 1883 | 217,618.45 | |
| " " New York, year 1883 | 4,261.70 | $221,880.15 |
| Balance to credit of mine, year 1883 | | $436,474.74 |
| " on hand January 1st, 1883 | | 23,619.34 |
| Total | | $460,094.08 |
| **Balance accounted for as follows:** | | |
| Construction work during the year | $24,810.62 | |
| Mining property purchased | 2,000.00 | |
| Mill-site purchased | 255.00 | |
| Brown & Ryan, paid in full | 22,341.04 | |
| Dividends paid during the year | 300,000.00 | |
| Loans due company | 103,783.40 | |
| Denver Exhibition Bonds | 1,000.00 | |
| Cash on hand | 5,904.02 | |
| Total | $460,094.08 | |

### THE GRANITE MOUNTAIN MINING COMPANY, PHILIPSBURG, MONTANA.

We have before us the first annual report of this company, which has eleven claims aggregating 10,675 linear feet on the "Granite vein" in the Flint Creek Mining District, four miles east of Philipsburg. The development-work, on the 21st of November last, consisted, according to the report of the president, J. R. Lionberger, of 258 feet on tunnel No. 1, 988 feet on tunnel No. 2, 130 feet below No. 1, and 507 feet on No. 3, 140 feet vertically below No. 2. Nos. 1 and 2 are connected by a vertical shaft. The principal discovery of ore was in No. 2 858 feet from the mouth, the rich chimney continuing for 130 feet, varying in width from 2 to 7 feet and averaging 200 ounces. In June last, contracts were entered into with the owners of the Algonquin mill, and a run of 505½ dry tons yielded $85,900.70, and a second run of 929½ tons gave $187,997.11, an average of $190.86, all from No. 2 tunnel. Mr. Frank L. Perkins, the superintendent, reports that the company has now a No. 4 Burleigh compressor, three Burleigh drills, and a diamond drill, used for prospecting. He proposes to drive Nos. 1 and 3 tunnels, to develop the ore-body struck in No. 2, and recommends the driving of a fourth tunnel below the others. The financial statement of the company for the period from September 3d, 1881, to December 1st, 1883, shows its receipts to have been $41,600.10, raised by loans; $39,246.59, proceeds of stock sold at $1 per share; and $273,897.81, the returns for 248,864 ounces of fine silver at New York. The company has repaid the loans with $2390.49 interest, has expended $64,216.34 for pay-rolls, supply bills, and freight; paid $40,455.96 for milling, $25,431.75 for real estate purchased, $12,703.22 for supplies, machinery, and freight bills; $4402.14 for express charges, and $3726.36 for express on bullion. The company has invested a surplus of $120,000, and has a cash balance in the bank at St. Louis, the home office, of $39,743.67. The company is managed in a sound, conservative manner.

### THE PEWABIC MINING COMPANY, LAKE SUPERIOR, MICH.

Treasurer D. L. Demmon says, in the report of the Pewabic Mining Company for 1883, that work has been pushed as fast as possible consistently with economical working, the directors believing fully that, if the mine should be worked at all, it should be done vigorously and systematically; and if there is nothing of value there, the sooner it is proved so the better for all concerned. It is needless to say that, so far, the workings have been a grievous disappointment to all interested, and certainly to none more so than your directors; for it has always been, and still is, fully believed by them that somewhere in the Pewabic territory there are large deposits of copper, and every endeavor has been made to find them, but, so far, unsuccessfully. This same lode, or a lode in nearly the same situation in Quincy, has proved rich and very valuable on their property nearly adjoining us, while in Pewabic it is hardly worth working. We shall continue to test it to prove fully its value, and we may at any time strike into a similar rich and valuable body of ground that would quickly repay all expenditures. That there is no occasion to despair of finding it, is needless to say; for there have been times during the existence of the Quincy when that mine showed no better for the future than the Pewabic does to-day; but the management was fortunate in having ample funds in the treasury, which it used for explorations, and continued working the mines. Superintendent Vivian says of the prospects that, taking into consideration the new lode, which in character is similar to those on the foot-wall side of the main deposit at the Quincy, I think our prospects the coming year are a little brighter than they were in 1883. This is not allowing for the chances of developing valuable ground, provided the openings are pushed, in the course of the main lode through the unexplored territory. The openings of the year embraced 352·1 feet shafts, 396·2 feet winzes, 2546 feet drifting, and 436·7 feet cross-cuts. The stoping was 2953¾ fathoms. The receipts from the sale of copper during the year were $197,262.36—1,239,740 pounds at 15·912 cents. The yield of mineral from rock was 1·24 per cent, or 1,434,385 pounds. The yield of ingot from mineral was 81·68 per cent, or 1,171,847 pounds. The financial status of the company January 1st, 1884, was:

ASSETS.

| | |
|---|---|
| Copper on hand, 504,652 pounds, at 14⅞ | $75,066.99 |
| Cash on hand | 1,393.35 |
| Due from assessments (since paid) | 14,148.00 |
| Supplies at mine | 53,828.42 |
| Total | $144,436.76 |

LIABILITIES.

| | | |
|---|---|---|
| Loans | $55,751.02 | |
| Drafts outstanding | 23,835.91 | |
| Forfeited stock (due for) | 1,818.75 | |
| Smelting, November and December | 1,564.74 | |
| Freight | 258.48 | |
| Liabilities at mine | 21,526.25 | $104,755.15 |
| Balance assets over liabilities | | $39,681.61 |

### THE HOPE MINING COMPANY, PHILIPSBURG, MONTANA.

Mr. Frank L. Perkins, superintendent of this company, reports that the ore-bodies in the Hope, Comanche, and Emma mines have been exhausted, and thus far his prospecting-work has not developed ore-bodies except on the Potosi claim. During the year, the company drove 280 feet of shafts, 461 feet of tunnels, 965 feet of levels, 55 feet of winzes, 157 feet of rises, and 1682 lineal feet of stopes at a cost of $45,147.50. The mill ran 188 days, crushing per stamp in twenty-four hours 2·45 tons of ore, or an aggregate of 4529 tons, with an average assay of 26·895 ounces of silver. The average yield was 82·441 per cent; 424 tons of tailings were also worked, carrying 21·554 ounces of silver per ton, yielding 65·986 per cent. The total cost of milling was $39,242.90, so that the cost per ton was $8.33. As in the case of many other Montana mines, the cost of salt was a very heavy burden, the present stock, the cheapest ever used, costing $55 per ton. The opening of railroads has, however, given relief, and salt can now be obtained from three competitive sources, delivered at Drummond station, on the North Pacific, 16 miles from the mines, at $25 per ton. A very interesting series of figures is given by Mr. Perkins on the cost of working the diamond drill for prospecting. Boring 2784 feet and seaming 388 feet cost $2751.38, or 86·7 cents per foot. The actual running time was 530·5 hours, and the average feet run per hour, therefore, 5·98. The company paid four dividends, aggregating $56,520, and has a balance of cash in bank at St. Louis of $82,234.62.

## COAL AND IRON IN ALABAMA.

Special Correspondence of the Engineering and Mining Journal.

The certificate of incorporation of the Watts Coal and Iron Company was recently registered in the office of the clerk of the Probate Court of Jefferson County. The purpose of this corporation—which has a capital stock of $150,000, with authority to increase the stock to $1,000,000, divided into shares of $100 each, and which will operate from Warrior station in this county—is to mine, transport, buy, and sell coal and other minerals; to operate coal and iron mines; to make coke; to mine and sell iron ore; to build railroads, engines, and machinery, and other business pertaining to those branches; to purchase or sell real estate; and buy and sell goods. The stockholders have elected the following board of directors: Eugene Morehead, W. M. Morgan, Durham, S. C.; G. S. Watts, Baltimore County, Md.; J. F. B. Jackson, J. E. Du Boise, and G. D. Fitzhugh, Blount Springs, Ala.; John N. Webb and Augustus W. Graham, Hillsboro', N. C. President, Eugene Morehead; Vice-President, J. F. B. Jackson; Secretary, Treasurer, and Superintendent, John N. Webb. The first shaft to be sunk by this company will be about 3½ miles south of Warrior, and some three hundred yards from the line of the Louisville & Nashville Railroad, near Morris station.

The Warrior Coal and Coke Company's first mine will be opened about two miles northwest of Warrior. Books of subscription to the capital stock of the Birmingham & Tennessee River Railroad Company will be opened at the office of the probate judge of Jefferson County, in this city, on Saturday, March 22d, 1884. Already a force of 112 negro laborers has been set to work on the first division of this road near the new town of Sheffield, on the Tennessee River, the force having been brought from Atlanta via Birmingham. It is employed on what is known as the Gordon contract. The location of this road will be second to none of all the roads running through the coal-fields of this State. For two thirds of its entire length, it will traverse the heart of the famous Warrior coal-fields, and will be the means of opening up a great many new mining properties. For cheap mining, this road will have great advantages, such

as the drifting system and natural drainage, possessed by few roads in this State, as almost every seam in the Warrior field is exposed along its entire route. The course of this road will be northwest and southeast. Jeremiah Baxter, W. McCracken, and John H. Sample are the board of corporators. Messrs. W. B. Wood, of Florence, Ala.; Jeremiah Baxter, of Nashville; W. V. McCracken, of Columbus, Ohio; John H. Sample, of Granville, Ohio; and H. L. Terrell, of New York, have filed articles of incorporation with the probate judge of Colbert County, preparatory to organizing the Alabama Improvement Company. They propose to issue one million dollars in stock, and do a general mining, immigration, and industrial business.

Twenty-five coke-ovens are completed and in full operation at the mines of the Broken Arrow Coal and Mining Company, St. Clair County, Alabama. A very fine quality of coke is manufactured and shipped. It is learned from Messrs. Noble & Co., of Armiston, Alabama, that the coke is of very good quality. There are efforts now making for the opening of more coal mines along the line of the East and West Alabama Narrow-Gauge Railroad in the Coosa field.

The output from the mines of the Pratt Coal and Iron Company at Pratt mines, Ala., for January, was 53,000 tons. Taking this as a basis upon which to estimate the output of the other mines in the Warrior region north of here, they may safely be estimated as follows:

Coalburg Coal and Coke Company, 15,000 tons; Pierce Warrior Coal and Coke Company, 7000 tons; M. G. Hoene Coal and Coke Company, 5500 tons; M. G. Hoene Jefferson Mines, 1500 tons; Brake Coal Company, 4000 tons; Milner Coal and Railroad Company, 8000 tons. Those in the Cahaba fields as follows: Cahaba Coal and Coke Company, 6000 tons; Pratt Coal and Iron Company, Helena Mines, 9000 tons; Montevallo Coal and Railroad Company, 6000 tons; Brierfield Coal and Iron Company, 2500 tons.

In the Coosa field, but little has been done. The only company operating there, which recently began running, is the Broken Arrow Coal and Mining Company. Its product is about 1500 tons for January. In all, the total is about 119,000 tons for the State. This, I think, will be a fair estimate, as the reports which I usually look for come in very irregularly, and I can only base my estimate on what I see. February's output will probably exceed these figures by about 10 per cent.

BIRMINGHAM, ALA., Feb. 22. CHARLES M. WEISS.

## WATER-POWER WITH HIGH PRESSURES.

For the purpose of supplying water to the placer mines in California, numerous ditches were constructed on the western slope of the Sierra Nevadas; and in many cases, the mines having been exhausted or abandoned, the water is now used for power for various purposes, and it is probable that, as manufacturing assumes larger proportions, much of the motive power required will be obtained from these ditches, which, in the aggregate, would afford several hundred thousand horse-power.

The problem presented, as stated by Mr. Hamilton Smith, Jr., in a paper read before a meeting of the American Society of Civil Engineers, has been the utilization of a small quantity of water; few of the ditches carrying more than 70 or 80 cubic feet per second, with high heads ranging from 280 to 600 feet. Turbines have not given satisfactory results, because the great speed due to the high head resulted in excessive wear and tear. Partial turbines or tangential wheels had better success. In some cases, large overshot wheels were built, one having a diameter of 65 feet. A wheel of a very simple form, called the "hurdy-gurdy," was introduced some twenty years ago, and has almost superseded all other hydraulic motors. It has been improved from time to time, and now gives an astonishingly high percentage of useful effects. As at first used, the "hurdy-gurdy" was a narrow wooden disk fastened to a cast-iron spider frame; the faces of the large wheels being from 4 to 6 inches wide, the buckets being iron castings. Such wheels were built as large as 21 feet in diameter. These wheels cost little, required but light foundations, and when large, really acted as fly-wheels. There was also nearly entire immunity from accidents. With the flat bucket, an efficiency of not more than 40 per cent could be obtained. Daubisson describes somewhat similar horizontal wheels used in the Alps, the water being led to them by steeply inclined troughs. Probably the use of a jet escaping from a pipe is a California invention. The first improvement on these wheels was made by putting flanges on the side of the rim with curved sheet-iron buckets between. Useful effects of from 35 to 45 per cent were obtained from these wheels, the best results being obtained with the use of comparatively large nozzles discharging the water. The next important improvement was what is known as the Knight wheel, made of cast-iron, with curved buckets set close together, the nozzle being a narrow slip curved to fit the outer edge of the wheel, in order that the jet might strike the buckets as closely as possible. An efficiency of from 54 to 65 per cent was obtained from these. The wheel known as the Collins wheel gave still more effective results, running up to an efficiency of 70 per cent. The latest so far used is known as the Pelton wheel, which has a bucket constructed so as to split the jet as it strikes the wheel; the bucket consisting of two sections of circles intersecting at the center of the wheel, and with convex surfaces presented to the jet.

Details of various experiments upon these wheels were given, showing an efficiency of from 82½ to 87 per cent, and the writer believes that, with heads above 100 feet, or even less, a larger amount of work can be got out of water by the "hurdy-gurdy" than by any other form of wheel. Possibly water-pressure engines may give as good or even better results; but their cost is very much greater. Where a wheel is so placed that it will at times be submerged, the turbine is preferable; in other respects, however, the "hurdy-gurdy" possesses the advantage. A description was then given of the method of using water-power for drilling the North Bloomfield tunnel in California, which was accomplished by the use of the "hurdy-gurdy" wheel. The water was carried by a pipe main of single riveted sheet-iron, No. 14 gauge, in lengths of 20 feet, put together stove-pipe fashion, with the joints made tight by tarred cloth strips and pine wedges, the diameter of the pipe being 15 inches at the pen-stock, diminishing to 7 inches at the lower end. The aggregate length of the main and branches was about 10,000 feet. The pipe was laid on the surface of the ground, the range of temperature being from 10 to 107 degrees Fahrenheit in the shade. Both the pumping and the working of the diamond drills were done by the use of the "hurdy-gurdy" wheel. The head of water here averaged from 280 to 550 feet.

Descriptions were also given of the water-power in use at the Idaho gold mines in California, where the supply main is of wrought-iron 22 inches in diameter, 8700 feet long. The pipe is placed in a bath of boiling coal-tar and asphalt before laying. This pipe is double riveted, and has riveted joints, the head being about 525 feet. Seven "hurdy-gurdy" wheels are employed driving air-compressors, pumps, hoists, and stamp-mill. The power is transmitted by Manila rope at high speed. The writer also referred to the wrought-iron pipes used for the water supply of San Francisco, which had been laid for a number of years, and seemed now to be in perfectly good order, and without tubercles.

## THE BEDFORD CANNEL COAL.*

By Edward Orton, Jr.

In the hills of southern Jefferson and northern Bedford townships, Coshocton County, Ohio, is found a coal-vein, to the structure and possible economic importance of which I wish to call attention. It is most widely known as the Bedford Cannel, the largest tracts of it being found in Bedford township.

Though there are, in nearly all the coal-bearing counties of the State, small local deposits of cannel coal, yet only six places assume sufficient importance to be called cannel-producing districts. Five of these are located respectively at Flint Ridge, Licking County; Millersburg, Holmes County; Sand Run, Hocking County; Milton township, Jackson County; and in Eastern Columbiana County. The first two deposits are of very small importance; the Darlington cannel, of Columbiana County, is so inferior to that just over the Pennsylvania line that it assumes no importance as yet, and the developments at Sand Run and Jackson County are of about equal and growing importance. The sixth and last deposit, the Bedford cannel, is the largest and probably the best body of cannel in Ohio; but its remoteness from railroad travel has prevented its reputation or use from extending far. The field was carefully worked over during the summer of 1882 for the Geological Survey now in progress; a sketch map was constructed upon which many valuable details were placed, and which is to appear in Volume V. of the Survey, when published.

The area of ground covered by the coal is not large; its outlines fall between Jackson township on the east, Newcastle on the west, the Walhonding River on the north, and Tunnel Hill on the south. Not all the square area falling inside these points, and which is just about 16,000 acres in extent, is covered by the formation; aside from that which the drainage of the territory has cut out, the curved line which marks the boundary does not include more than 12,500 or 13,000 acres. Inside this rough and approximate line, which indicates the feather-edges of the formation itself, are other lines which mark the spaces covered by the valuable cannel, or that of minable thickness. The latter boundary has been laid down with much greater care than the first, and probably does not include more than 3000 acres. This area has still to be diminished by what has been cut out by drainage, which leaves, as nearly as can be estimated, between 1400 and 1500 acres of valuable ground. Besides what falls inside the limits assigned, outliers of this coal are found in one or two localities near by, but of such inferior quality as to scarce need mention; one in Newcastle township showed three and a half feet of a rich black shale, while nearly seven feet of bone coal was found about two miles north of the Walhonding River on this level. To the eastward, at Roscoe, the cannel reappears, and, according to some reports, may be found continuous exposures from that point to the cannel district, but there is much doubt as to the truth of this assertion.

The hills of this part of the county are rather low and regular in shape; the valleys are of medium width, and on the slopes, about sixty feet above drainage level, is the place of the coal. The hills do not rise more than 200 feet higher than this level.

The geological horizon of this coal has been much disputed. According to Dr. Newberry, it is the Putnam Hill limestone seam or No. 4 coal. Professor Hodges, who, during the former work of the Survey, had Coshocton County in charge, called it No. 3, or the Zoar Limestone coal. The principal effort of this recent work was directed toward settling this matter. The coal proves to be neither 3 nor 4, but the Upper Mercer limestone coal or No. 3A. There would still be room for doubt as to the certainty of this decision, if the very facts which misled both these authorities on the subject had not been found. The inquiry of both was turned at once to the two most prominent coal-banks in the cannel district, and from them, without any comparisonof the other banks easily accessible, was the horizon determined.

By a peculiar accident, the Lower Mercer limestone is wanting at these two banks, which are in close proximity, so that the opinion of Professor Hodges, at least, is not unreasonable. When the coal is found under a blue limestone, and occurring at approximately the right interval below the Gray Limestone level above, it is natural, from these facts *alone*, to call it the Zoar Limestone coal or No. 3, as this horizon is the most constant and faithful of the lower coal measures.

But at every other coal-bank in the district the real Zoar or Lower Mercer limestone is found about twenty feet below the cannel, and covering a small coal-vein of its own. Hence, no alternative is left but to call the upper limestone the Upper Mercer, and the coal No. 3A. This section was obtained on all sides of the two banks before mentioned. On the farm of James Sharpless, the two Mercer limestones and coals were obtained in the regular order on the east back of Simmons's Run, while scarcely 300 yards distant on the opposite side of the valley, the lower limestone and coal are completely elided and replaced by sand-rock, while the upper limestone and coal are met in their finest development.

The conditions under which this cannel grew, occurring as it does in the midst of veins of bituminous coal, and indeed accompanied and sometimes replaced by them, is a source of much speculation to many thoughtful people.

The formation of cannel coal is now quite generally acknowledged

* A paper read before the Ohio Institute of Mining Engineers.

to be due to the decay of vegetation under water, instead of in the spongy state of moisture which characterizes the peat-bogs of the present, and which must have existed in the bituminous coal-swamps of the Carboniferous age. In almost every coal-vein, small streaks of cannel, which cover limited areas and again disappear, are found, and by this theory correspond to periods of overflow, during which the vegetation of the swamp was decomposed under water and made cannel coal; when the bituminous matter filled up to the surface level again, the conditions of a peat-bog were again assumed and the growth of bituminous coal proceeded. Thus it may be seen at once that the geological equivalence of veins of coal can not be in any degree connected, because both are cannel. The identity of the Millersburg, the Bedford, and the Flint Ridge cannels has been claimed on no better grounds. The Millersburg coal and the Bedford are probably the same vein; the Flint Ridge is not.

The patches of ground covered by valuable cannel are three in number. The two smaller ones are located in Jefferson township, on each side of Mohawk Creek, and to the east of Mohawk town. On these areas, are the workings of James and John Moore and James Givens. The latter is a new bank and has had but little attention so far. The Moore banks are both old, and were worked in former years on a large scale, but have now fallen to the level of farmers' or neighborhood banks. In these workings, the cannel is six feet thick, with about a foot of poor bituminous coal above it, which serves to make an easy "bearing-in" or "cut."

Eastward from the Moore's banks, the cannel thins down to a foot or so, included between 18 inches of bituminous coal above and below. The vein is here unworthy of mining. After passing Flint Run, the coal increases in thickness, until, on the hills of the Simmons Run Valley, it attains one of its best showings. Here are the workings of Messrs. Sharpless, Lyman, Mowrie, and Creighton. The coal is five feet thick and with three feet of good bituminous coal as a roof. On the opposite side of the run, the cannel appears at full thickness, but on the other side of the hill has dwindled down to ten inches of cannel and about a foot of bituminous coal. To the eastward, even *this* scanty showing disappeared.

To the south of the Sharpless bank, which is on the southern edge of Jefferson township, the largest body of fine cannel lies. It has been tested by small pits all through the country-side. It extends in an elongated point as far south as Tunnel Hill in the center of Bedford township. The whole district is dotted with coal-banks. Nearly every farmer has *some* coal-vein opened on his lands, and many exposures of the cannel coal are found. In most of the area, it figures as a thin stratum from six to twelve inches thick, overlain and underlain by common coal. When, in the spots of valuable ground, the cannel part of the coal thickens up, the under coal disappears, leaving the cannel resting on a stiff fire-clay floor. The number of banks open, or which need only a few days' work to be in mining order, are only eight; five of these are now in good condition.

They are all much the same in appearance. The cannel runs from two to six feet, averaging perhaps four feet. Over it, returning, from one to three feet thick, lies a soft, sulphurous, bituminous coal, easy to mine and affording every chance to get at the hard, solid cannel beneath. In the bank of James Moore, which in former days was worked on the largest scale of any in the district, the mining was conducted on a loose attempt at the single entry plan. The butts and face of the coal are more marked than in bituminous mines, and it would be next to impossible to drive an entry at an angle through the coal. The face of the coal is most beautiful and smooth. At intervals of about sixteen inches, occur joints parallel with the face and also butt slips as well. When one block is moved from its place, the use of hammer and sledge alone suffice to bring down the entire wall, like the regular blocks of masonry. When powder is employed, the "bearing-in" is made above and the shot placed in the bottom of the cannel. The result of a blast is a large amount of square blocks with almost no dust or fragments. So little slack or broken coal is made in ordinary working that it is necessary to break a large block by a sledge, into pieces of the requisite size, in order to get a sample for the cabinet or for analysis.

When once under the hill, the roof is perfect; the top coal is mostly left up and the firm limestone arch stands solid over that. Immunity from danger tends to lead a miner into negligence and carelessness. In these banks, which have every advantage and encouragement to be the most orderly and regular possible, great cavities, supported by inadequate ribs and all the forms and results of poor mining may be seen. The previous workings have been made on such a large scale that bank room for a good many men could be rapidly provided.

The palmiest days which this neighborhood has ever seen were those before the war. In those times, the supply of the oils, such as naphtha and gasoline, was quite limited. The distillation of this cannel coal for gas accidentally revealed what stores of these oils were laid away in the dull black mineral.

Large developments were immediately set going. The bank-mouths were surrounded by lines of smoking retorts, and the product of oils was fairly coining money to the fortunate owners. At this time, the war began, and soon after, the discovery of large wells of petroleum stopped this young industry and left it as a bursted bubble. The rusty retorts, half-buried vats, and piles of charred refuse are still to be seen. How would the prophecy have been received in those days that the oils which they slowly distilled from the coals should flow from the earth in such enormous amounts as 1000 barrels an hour?

From time to time, a market has been opened for the coal; but the distance from rail is now between ten and twelve miles, and this makes it very expensive of course. It has been tested in New York and has been praised as a most excellent article, in every respect the equal of the English imported cannel, except a trifling increase in the per cent of ash. There are three grades of the coal. The middle part of the seam is the best, the bottom next. The top is the most valuable part for making oils, though it is so high in ash as to be often slaty or bony. The amount of sulphur is medium, and it is usually disseminated in fine shot-like pellets instead of the more usual forms.

The chemical composition of cannel coal ranges from that of pitch coal or albertite on one side to a bituminous coal or to an oil shale on the other, according as the pure pitch disseminated is in an impure shale or in a purer coal. Such a thing as a standard analysis of cannel has not yet been agreed upon. But in lists of analyses of so-called coals, those representing either the pitch coals, oil shales, or semi-bituminous types can often be selected. The following analyses were made in the laboratory of the Survey by Professor Lord:

| | Moisture. | Hydrocarbons. | Fixed carbon. | Ash. | Sulphur. |
|---|---|---|---|---|---|
| 1..... .... | 2·35 | 47·05 | 37·00 | 13·60 | 2·33 |
| 2..... .... | 2·32 | 44·52 | 41·13 | 12·03 | ·84 |
| 3 .... ... | 2·42 | 49·29 | 38·00 | 10·29 | ·84 |
| 4..... ..... | ..... | ..... | ... .. | .. .. | ..... |

1. Bedford Cannel.
2. Coal Run, Jackson County.
3. Trumbull County Cannel.
4. Sand Run, Hocking County.

The careful method of sampling so as to secure averaged results, and the efficiency of the methods employed, will make these analyses of much more value than those which were made in the previous work of the survey.

A few of these, as copied from Prof. T. G. Wormley's Report in Geological Survey of Ohio, 1870, are:

| | Moisture. | Gases. | Fixed carbon. | Ash. | Sulphur. |
|---|---|---|---|---|---|
| 1... ... .. | ..... | 36·80 | 43·25 | 19·95 | 1·31 |
| 2... ..... | 2·60 | 40·20 | 44·00 | 13·20 | 1·34 |
| 3..... ... | 1·65 | 37·35 | 44·65 | 16·55 | 1·70 |
| 4..... | 4·30 | 37·70 | 51·75 | 6·25 | 1·25 |
| 5..... | 1·35 | 36·35 | 42·60 | 19·70 | 1·89 |

1. Flint Ridge Cannel.
2. Flint Ridge Cannel, 2d sample.
3. Holmes County Cannel.
4. Jackson Cannel.
5. Coshocton County Cannel (probably Bedford).

The wide differences of these analyses from the other Ohio cannels is probably due to the methods of analysis.

The owners of this cannel are mainly farmers. A railroad company, which years before was to run a road through this deposit, bought 700 acres of the finest of the coal. When it failed, the property passed into the hands of speculators, where it now remains. Of course, this deposit, valuable as it would be, is doomed to be inactive until railroad communication opens it up to civilization. Cannel coal in New York commands high prices, just as split wood for parlor fires does; $15 or $16 a ton is not unfrequently paid for English cannel, and our American cannels are just as good. Ohio cannel would probably be worth $4 or $5 a ton now, if it were wisely introduced into the proper markets.

As might be expected, the farmers, to whom this cannel is easily accessible, hold it in low esteem for the very points which make it courted by those who can not reach it. They prefer bituminous coal, whose heating power is somewhat higher, and the cheerful fire and cleanliness of the cannel go for naught.

It would seem that the day is now approaching when this peaceful country district must give way to the boisterous life of a coal mining community. The Mount Vernon, Coshocton & Wheeling Railroad is pushing rapidly forward, and probably by the end of the approaching summer, trains will be daily passing within two miles of the best of the cannel. Under such circumstances, it is nearly certain to be opened up.

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UNDERGROUND TELEPHONE WIRES.—In an article in a late issue of the *Popular Science Monthly*, by Dr. W. W. Jacques, the author says: "The American Bell Telephone Company has recently constructed two short lines of underground wires in the business section of Boston, and these give us excellent data from which to judge of the extent of technical practicability and the expense of putting all wires underground. We have seen that in Paris the retardation and induction are both obviated by the use of double and twisted wires in metallic circuit. It is necessary that all of the wires be in metallic circuit; for, if a metallic circuit be connected with a single-line circuit, the disturbances are not removed. If a subscriber in one city wishes to talk with a subscriber in a neighboring city, both cities must have metallic circuit systems and metallic circuits between the two cities. As the two lines constructed in Boston are short, only about one quarter of a mile each, it was deemed best to use single-line circuits, hoping that the induction and retardation on so short lines would not be serious. The system is constructed as follows: Eight wrought-iron pipes, 3 inches in diameter, are laid side by side in two rows, about 4 feet below the surface. At each street corner, is built a brick chamber, large enough to admit a man, and with a cover flush with the street. The cables, of which several kinds are in use, run out from the basement of the central office through these pipes and up the side of buildings to roofs, from which they spread out to the subscribers by means of ordinary overhead lines. Conversation over these lines is not so easily carried on as by means of overhead wires, and it is frequently possible to overhear other conversation. This prohibits further extension of the single-wire system underground, for technical reasons. The cost of the piping and chambers is, in round numbers, $50,000 a mile, and these pipes are intended to accommodate one thousand wires. The cost of the cables is from $60 to $150 a mile for each circuit, according to the kind of cable used. In round numbers, we may estimate the total cost for one thousand wires at $150,000 a mile, or $150 a mile per circuit. The cost of piping and chambers would be nearly as great for one hundred circuits as for one thousand, as the cost of chambers and the labor of excavating and filling would be the same; so that the cost for one hundred wires may be estimated at $50,000 a mile, or $500 a mile per conductor. The cost per conductor thus increases enormously as the number of conductors diminishes, so that it would be clearly impossible to follow out the wires of an exchange system in all of their bifurcations."

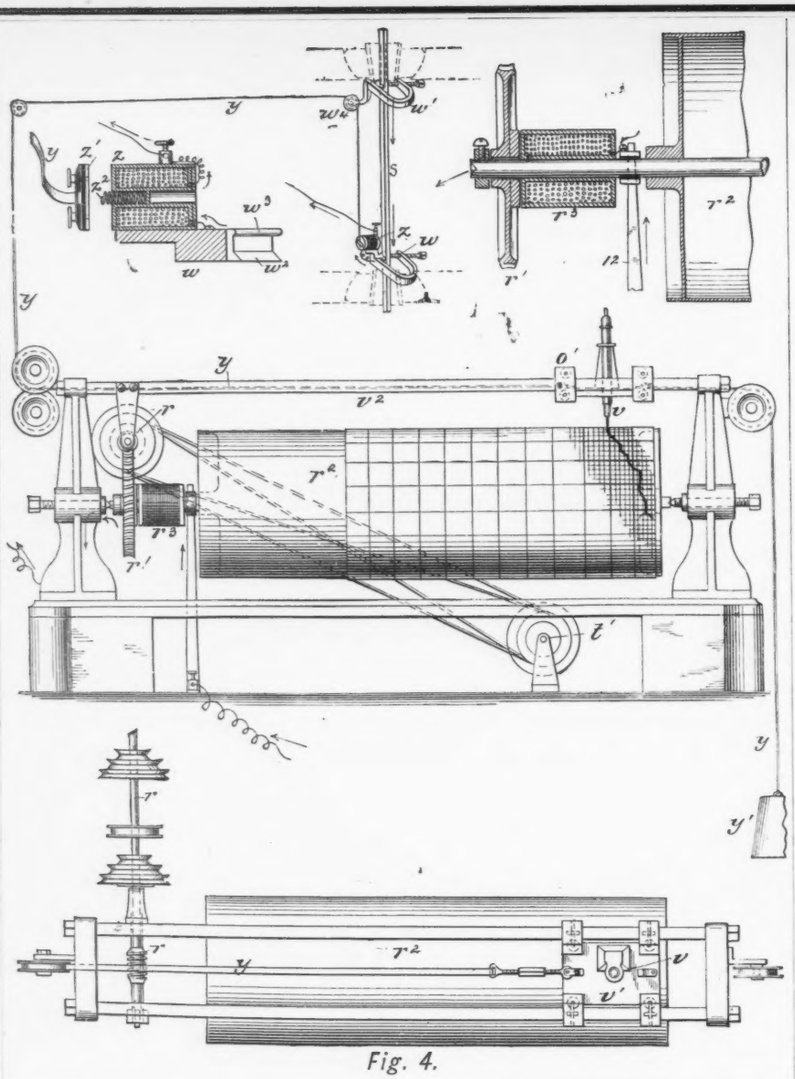


Fig. 4.

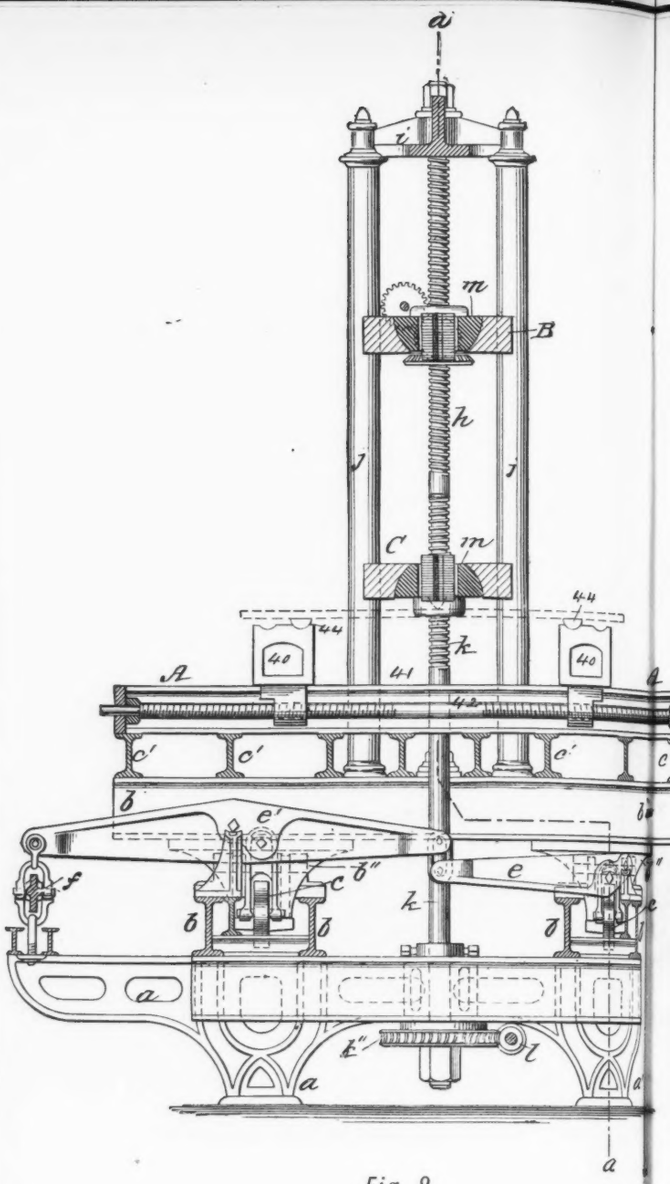
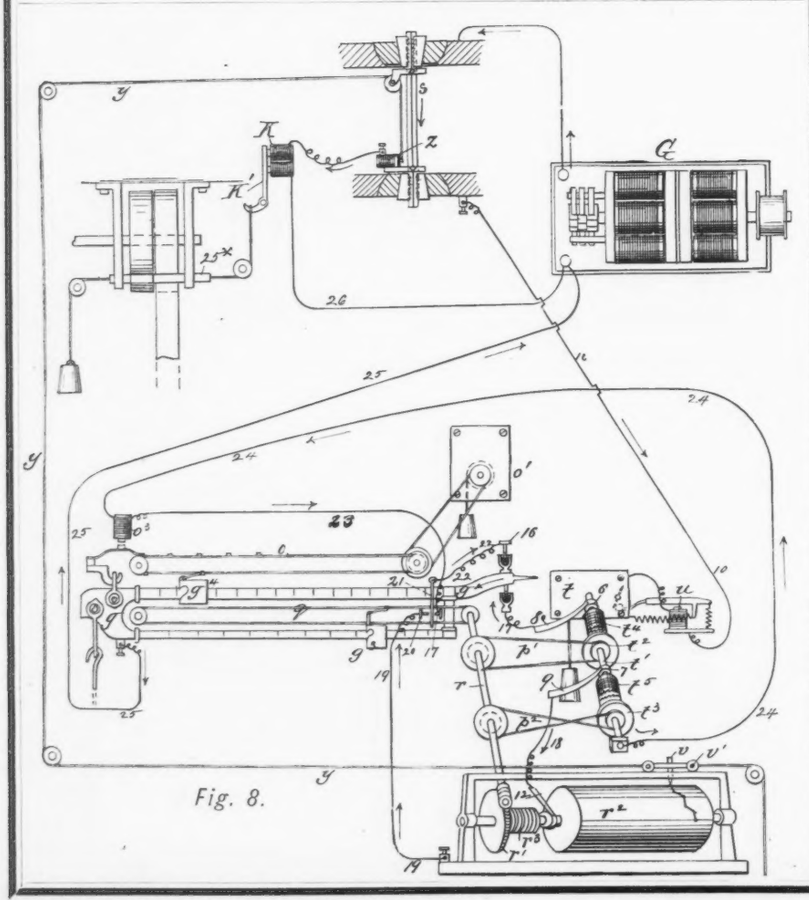


Fig. 2.



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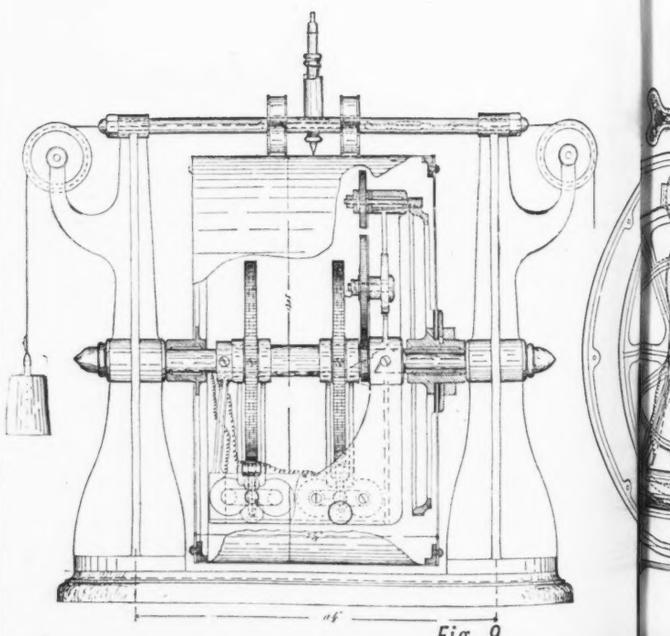


Fig. 9.

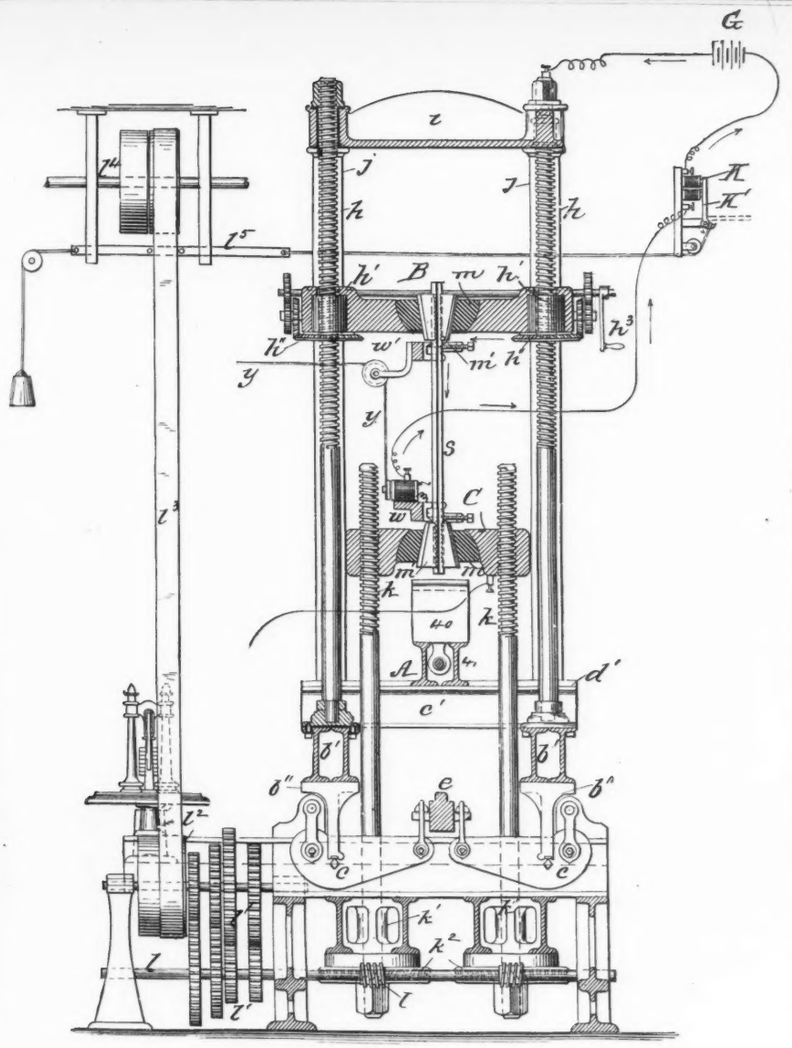


Fig. 3.

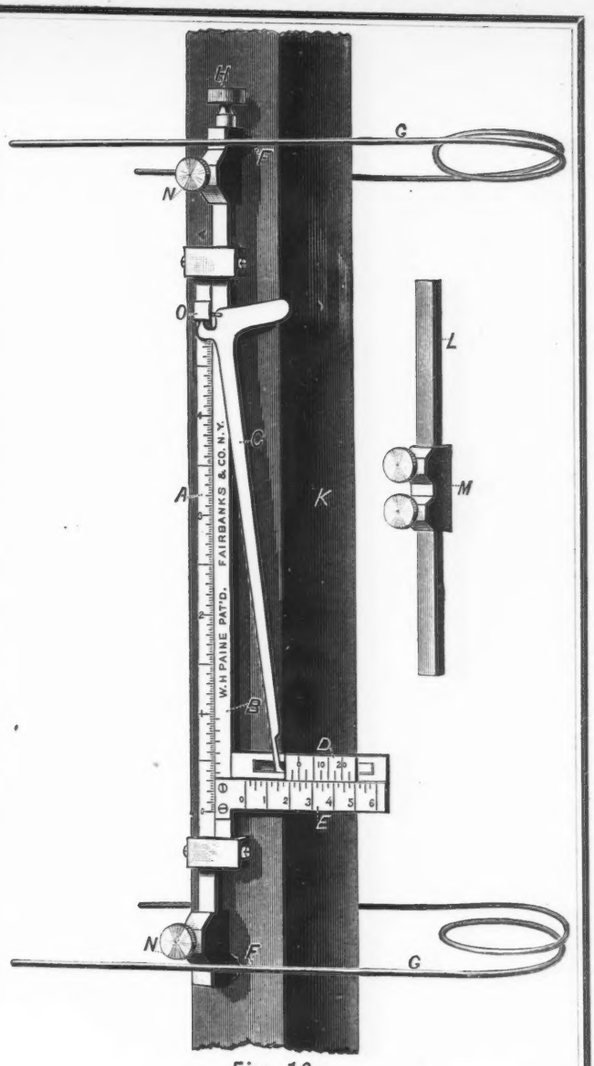
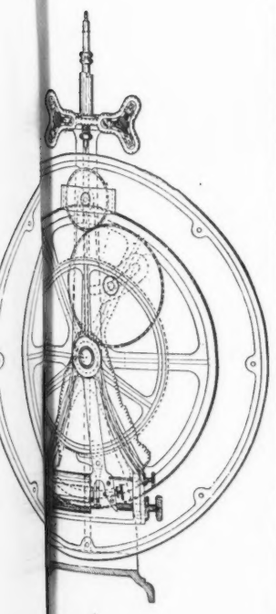



Fig. 10.



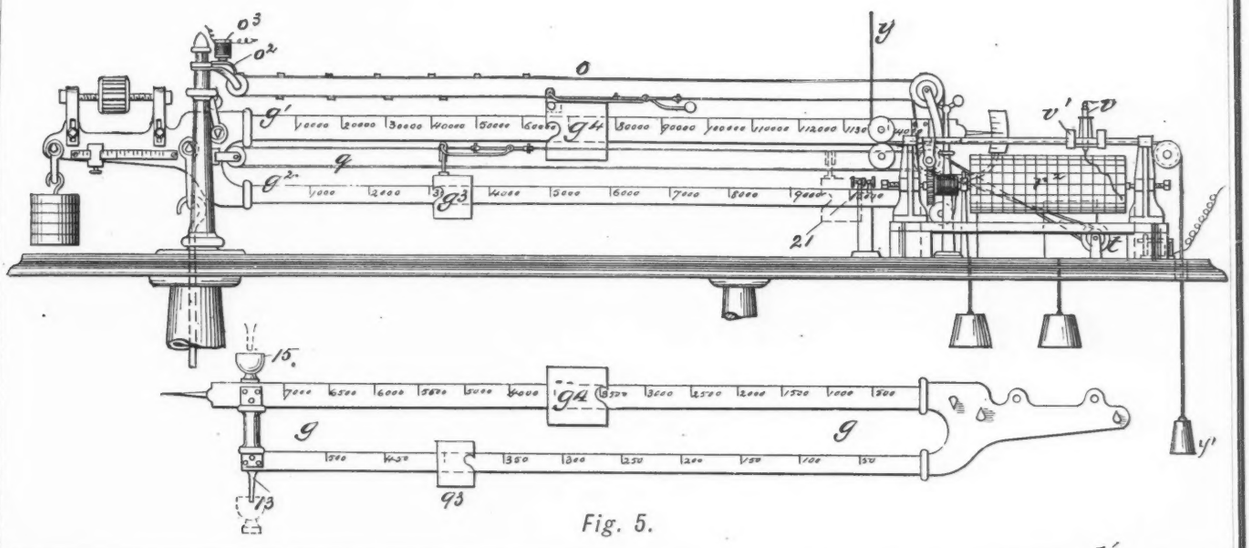


Fig. 5.

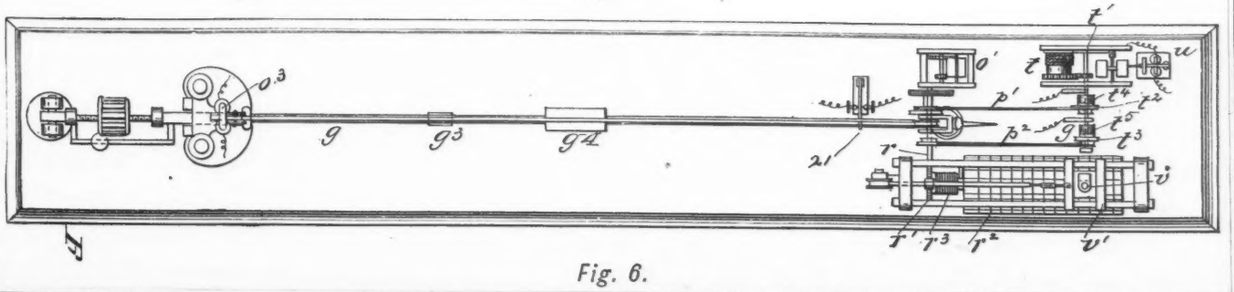


Fig. 6.

AUTOMATIC TESTING-MACHINE.

## IMPROVEMENTS IN METHODS FOR PHYSICAL TESTS.*

By Arthur V. Abbott, C.E.

WITH SUPPLEMENT.

Probably the earliest testing-machines used in America were some time between 1854 and 1856. One of the records gives an account of a small machine built by the late John A. Roebling, and located at his wire mill in Trenton, New Jersey. This machine consisted of a straining apparatus connected with a scale-beam, and was used to test the qualities of the wire employed in the suspension-bridges built over the Niagara and Ohio rivers.

The next machines were built by Major Wade and Captain Rodman, and are still in use in the Washington Navy-Yard and Army Building, New York City.

A machine shortly subsequent to the above was employed by Murphy & Plympton, at Trenton, New Jersey, for the purpose of making tests of bridge I-bars. This is the first machine on record intended for making tests on full-sized members.

There then occurs quite a gap in the history of American experiments, and the next move in the direction of further investigation was made by the United States government, in 1874, by the appointment of a board to make experiments on iron and steel and other metals, and an appropriation of $75,000 from Congress allowed for its use. The first action of the board was to cause proposals to be issued for the building of an appropriate machine, the result being to let to Mr. A. H. Emery, of Chicopee, Massachusetts, a contract for such a machine, to be completed within five months from date. Unfortunately, nothing had ever been constructed on the scale contemplated by the board, and it was some four years before the machine was completed; but the result has been to give to the government a machine which is in many respects without parallel, and which, as the Watertown Arsenal machine, is too well known to the members of the Institute to need further description here.

About two years ago, Messrs. Fairbanks & Co., having for some time been engaged in the manufacture of testing-machines, conceived the idea of locating in New York a bureau or office so arranged that engineers and constructors could be afforded an opportunity for making experiments and tests on any material, in any way, and to give to America a laboratory that should speedily become to our country what the laboratory of Kirkaldy is to England. The improvements in testing machinery given in this paper are the result of the desire on the part of Fairbanks & Co. so to arrange and to supply their department of tests and experiments as to meet the wants of all investigators. These details having been carried on under the supervision of the author, are now presented, hoping that they may be of interest to the Institute.

Five qualities are necessary to a successful testing-machine:

First. There must be a mechanism for producing stress up to the largest size of specimen that it is wished to test, and this mechanism must be sufficiently heavy and rigid to produce the stress without any distortion or undue straining of any of its parts.

Second. A contrivance for accurately estimating or registering the amount of stress applied to the piece under examination.

Third. A method for recording both the stress and its effects on the test-piece simultaneously.

Fourth. Such appliances to the testing-machine as shall enable the stress to be applied in any desired manner and to any wished-for shape of test-piece. And

Fifth. The ability of the machine itself to be easily and frequently tested, so that its record may hold the confidence of the community.

Many machines have, in one or more respects, failed to meet the above qualifications. Generally, in the older machines, there was considerable doubt as to the accuracy of the means employed to estimate the stress to which the specimen was subjected. In the hydraulic machines, a gauge or other means was used for estimating the amount of pressure per square inch applied to the ram of the hydraulic press. In such machines, the coefficient of friction is a constantly varying and uncertain quantity, so that an estimation of the pressure on the ram, however carefully made, is no accurate measure of the amount of stress to which the specimen itself is subjected. In machines so planned that the stress could be estimated in other ways than by the hydraulic gauge, the apparatus used was so crude or subjected to so many errors as to make the results obtained quite unreliable. Indeed, the Emery testing-machine was the only large machine at the time of its construction which was to be considered trustworthy.

In Fig. 1, an illustration of the machine now employed in the Department of Tests and Experiments is given, and which it is hoped may be found to combine some improvements on foregoing machines. From this illustration, it will be seen that the machine stands on two cast-iron legs, which may be supported by any suitable foundation that is sufficiently strong to hold the weight of the structure. On these cast-iron legs, there rests a frame-work of wrought-iron I-beams so constructed as to give the entire structure an exceedingly solid and firm basis. On this frame-work of I-beams, a system of levers is arranged in a manner very similar to that of ordinary scale work, only proportioned to successfully withstand the severe stresses that come on it from the shocks and other use of the machine. These levers support a secondary frame-work, also constructed of I-beams, and carrying on its top four long columns. On the tops of these columns, stands a heavy casting from which are suspended two side-screws, sustaining the top cross-head of the testing-machine, to which one end of the specimen to be examined may be attached. These screws are simply used as a rapid and convenient means of adjustability, so that long or short specimens may be rapidly accommodated. It will be noticed that this entire system, namely, the adjusting-screws and top cross-head, is supported entirely upon the upper frame-work of I-beams forming the platform of the testing-machine. Beneath the top cross-head, will be noticed a second cross-head, also supported on two screws, which are placed inside the adjusting-screws previously alluded to. These screws, carrying the lower cross-head, extend downward through the platform, and are attached to worm-gears firmly secured to the under side of the bottom frame-work. The worm-gears may be rotated in either direction at the pleasure of the operator, by means of the belt and a series of gears shown at the extreme right hand of the cut. This system of worm-gears and screws forms the straining mechanism of the machine, capable of applying any desired stress up to 200,000 pounds. Great care is taken in the construction of the machine, so that no part of this mechanism whatsoever shall touch or in any way come in contact with the platform of the machine, save solely and simply through the specimen to be tested. Consequently, no matter how much the lower cross-head be run up and down, no effect whatsoever will be produced on the platform, unless this cross-head be attached thereto by means of the specimen. Consequently, all the stress produced by the cross-head on the platform must necessarily pass through the specimen, and only this amount, and no more, can be estimated on the weighing-beam of the machine. A part of the scale system previously referred to may be seen on the front of the cut. The end of one of the large levers extends under the platform, and two small ones carry the stress from the end of this lever to the beam, and designed to increase the multiplication of the machine and reduce the amount brought to the beam itself. Over the larger one of these levers, are four small columns, extending upward, and supporting on their top a hand-wheel and ratchet. This is an auxiliary testing-machine, so planned that the one piece of apparatus includes two machines: one large one, for making tests of full-sized specimens, having a capacity of 200,000 pounds, reading to 10 pounds, and accommodating specimens up to ten feet of length; the other, having a capacity of 10,000 pounds, reading to half a pound, and accommodating specimens up to 2 feet of length. It will thus be seen that this testing-machine is a sort of *multum in parvo*, combining the capacity for making large and small tests.

Leaving the perspective view, let us pass to Figs. 2 and 3, to the longitudinal and transverse sections, taken directly from the testing-machine. Here will be seen, standing on the floor, the cast-iron legs $A$, $A$, supporting the frame-work of I-beams $b$, $b$, $b$, $b$. On these I-beams, there stand at each end two solid cast-iron blocks that support, hanging by two loops, the main levers $c$, $c$. On the center pivot of these levers, stand two castings $b^2$ and $b^2$, that carry the foundation I-beams $b'$ of the platform. On the top of these beams, there is arranged a series of eight smaller beams $c'$, which in their turn support the columns $j$ and $j$ that carry the top castings with the adjusting-screws $h$ and also the two longitudinal beams $A$, $A$, for supporting the transverse anvil-blocks 40. The other end of the main levers $c$, $c$ are attached, by means of their extreme pivots and loops, to the central levers $e$ and $e'$. These levers carry the strain imparted to the platform to the end lever $f$, whence it is carried to the beam, where it may be estimated by sliding the poises to and fro until a balance is obtained. It will also be noticed that, between the lower I-beams of the frame, there is placed a heavy casting $k''$. This casting supports the main driving-screws $k$, to which the lower cross-head $m$ is attached. These screws are kept in their place by a small collar placed on the top of the I-beams and by a worm-gear and a heavy nut on the under side of the casting $k''$. The worm-gears are cut respectively right and left handed, and correspond with a similar thread on the screws themselves. The object of cutting the screws with different threads is to cause them to rotate in opposite directions, and so to neutralize all tendency to twist or turn on the part of the cross-head, due to the large amount of friction caused by the screws under heavy pressures. The worm-gear may be rotated by means of the worms and the lower shaft $l$. This lower shaft is connected at the left hand of the machine with a series of gears and a tight or loose pulley, driven by a belt $l^3$ (Fig. 3). The object of these gears is to communicate different speeds of rotation to the driving-shaft $l$, so that the testing-machine may be driven at varying speeds at the pleasure of the operator, and that the cross-head may be moved up and down at such rates of speed as his judgment may deem the best for the specimen under examination. At the right hand of these gears, may be seen a set of reversing gears very similar to those employed in the ordinary lathe, so that at pleasure the direction of the motion of the cross-head may be changed from up to down or *vice versa*. The transverse section of the machine may also make the weighing system more plain. Here the two levers $c$, $c$ may be seen attached by their loops to the center lever $e$. The I-beams $b$ and $b$ stand on the pivots of the main levers, supporting in turn the I-beams $c'$, and the columns and adjusting-screws carry the top cross-head. It will be very obvious that the main screws carrying the lower cross-head pass entirely through the platform without touching it at any point. Perhaps the action of the machine may be more fully understood by supposing a test-piece in tension. The piece is first secured in the top cross-head $B$ by means of the wedges placed therein. The other end is then secured to the lower cross-head $C$, thereby forming the only connection between the platform and driving mechanism. As fast as the screws are turned, stress is exerted on the specimen, which is communicated to the platform, and may be weighed by means of the beam at the left hand. It will thus be seen that two qualifications have been here fulfilled. In the first place, the straining mechanism is sufficiently firm and rigid to produce all the stress that the machine is intended to exert, without any straining or undue distortion of any of its parts; and secondly, only that stress to which this specimen is subjected can by any possibility come on the platform.

A third qualification may be here mentioned as being peculiar to this form of testing-machine, and that is the capability, at any time, of testing the machine itself.

Referring again for a moment to the perspective view, it may be seen that the platform of the machine occupies considerable space, being some 10 feet long by 6 feet in width. Now, as this platform is supported simply and solely on the scale, any weight which is placed on it must be immediately felt by the beam itself; consequently, in order to test the machine, all that is necessary is to pile on the platform either a series of standard test weights or a previously weighed quantity of any material. If, for example, 20,000 pounds of dead-weight be placed on the platform, and by moving the poise out on the beam it is found that the beam balances at a corresponding figure, namely, 20,000 pounds, there is an ocular demonstration that a certain number of pounds of dead-weight produces a corresponding reading on the beam; consequently, if, when the piece of iron is placed between the jaws of the testing-machine, and it is remembered that the only stress exerted by the screws on the platform is transmitted through the piece, and 20,000 pounds are indicated on the beam, it is obvious that the specimen must

*A paper read at the Cincinnati Meeting of the American Institute of Mining Engineers.

be undergoing a stress of a corresponding amount. It may be stated that, in the process of manufacture of all such machines, each of the levers which enter into the construction is sealed separately; that is to say, when the lever is made, it is hung on its fulcrum, and weights in the proper ratio are hung on each of the exterior pivots. The edges of these pivots are then moved to and fro slightly until the loads on each exactly balance each other. The lever is then supposed to be correct, and after the entire machine is set up, weights are piled on the platform, and the beam and the poises adjusted until every mark on the beam is indicated by a corresponding amount of dead-weight on the platform, so that it will be readily seen which again caused the beam to move; consequently, it is obvious tha a load of 60 per cent of the smallest reading of the poise was sufficient to cause a visible motion of the beam, even under a heavy load in the machine. The following may be quoted from the report of government engineers detailed to inspect a machine similar to this, built a year ago for the Navy-Yard in Washington: "We also tested the machine for sensibility, both before and after subjecting it to the maximum strain, without finding any difference. It responds promptly to a weight of 1¼ pounds, which may be taken to be its maximum error." The preceding example is the way in which the machine is most commonly called to act, namely, of tension. It is, however, equally adapted to make

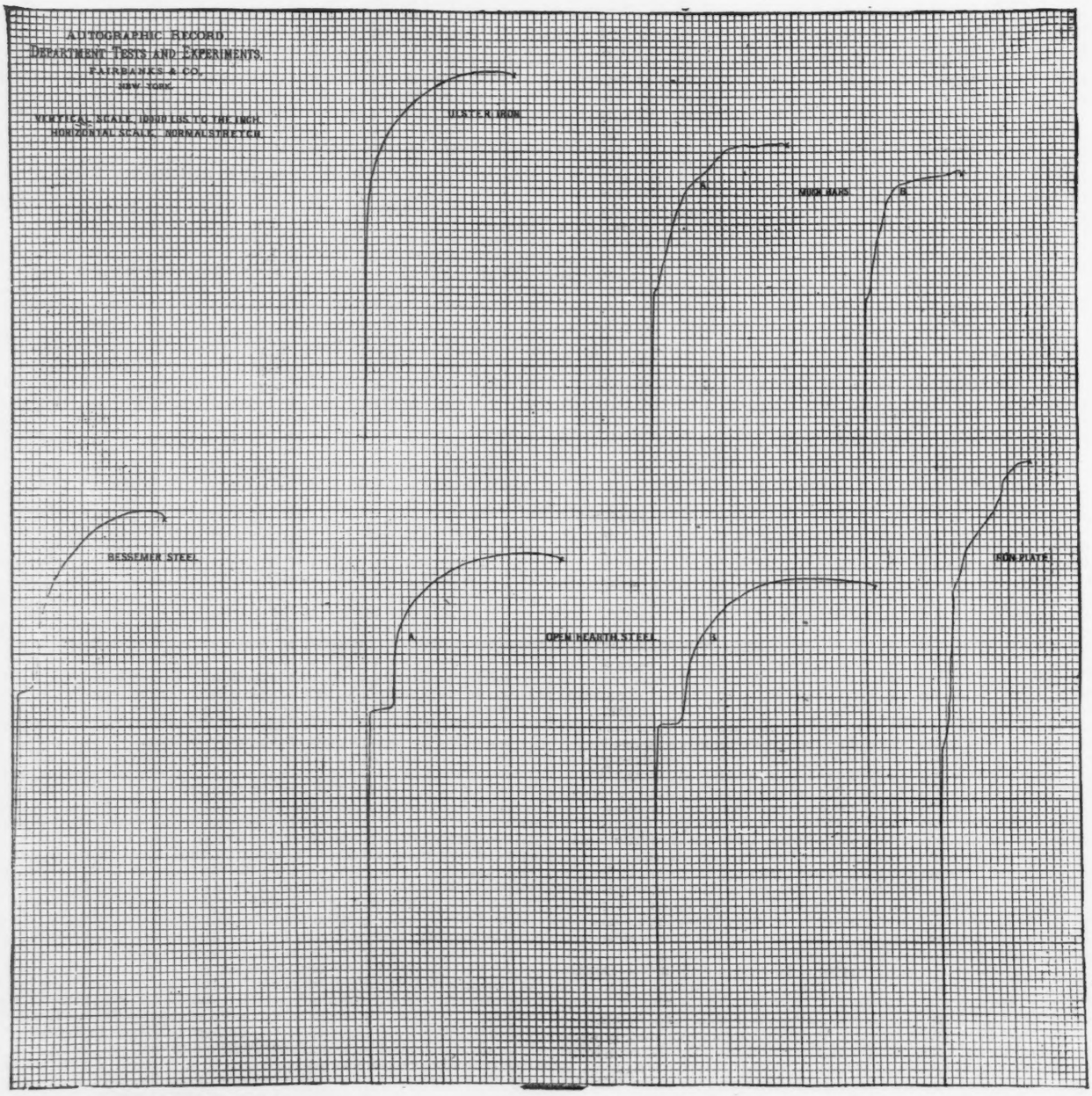



Figure 12.

the machine is adjusted to itself, and all coefficients of friction whatsoever are thereby eliminated. Of course, it may be urged that in time the edges of the pivots may become dulled and the coefficients increased. This is true; but in fact, so far as is known, no machine has been constructed which is not susceptible to some wear in the course of time. Simply as a matter of history, it may be stated that the machine now brought to your notice has been in constant and severe use for nearly two years. An experiment tried a few days ago reveals the following facts: When the machine was unloaded, a weight of three quarters of a pound on the platform caused the beam to promptly rise and stand at the top of its surrounding guard. As the least reading on the poise indicates a weight of 10 pounds in the machine, an error of three quarters of a pound necessary to turn the beam may be considered so small as hardly to be worthy of notice. A test-piece was introduced into the machine, and a strain of 100,000 pounds placed on the platform, and a weight of 6 pounds of dead-weight was then added to the platform, experiments in compression, transverse strains, shearing, bulging, punching, and torsion.

In Fig 2, a skeleton specimen may be seen, calling the capacity for transverse tests into play. The transverse blocks 40 and 40 are carried to and fro on the platform by means of screws 42, so that they may be adjusted with reference to the center of the testing-machine at the pleasure of the operator. Under the cross-head *C*, will be observed a small triangular block, which is depressed with the motion of the cross-head and applies the stress to the specimen that is supported on the hardened steel blocks 44. These hardened steel blocks are semi-cylindrical in shape, and rest in concavities cut in the top of the supports 40. The object of these blocks is to permit the piece freely to deflect under the application of the central load, while at the same time the original span used in the experiment is rigidly preserved as the blocks rotate about their centers, maintaining a constant distance from each other. By removing the triangular-shaped jaw from the under side of the cross-

head, and substituting in its place a flat iron plate, and placing on the I-beams underneath a similar plate, the machine may be readily and easily arranged for compression-tests. In these three examples, it is plain that the entire stress to which the specimen is exposed is transmitted through the piece to the platform. In the case of the tension specimen, we have a downward pull on the piece, transmitted along the adjusting-screws to the columns, and thence downward on to the platform. On the transverse tests, we have the downward pressure of the cross-head transmitted to the supporting-blocks, thence to the I-beams *A*, *A*, and then on to the platform; and in the case of the compression test, a similar result is obtained by transmitting the pressure directly through the piece to the I-beams *A*, *A*, so that in all conditions and under all forms of stress to which the material can be exposed, the test-piece forms the only connection between the weighing and the mechanism employed in producing the stress on the piece.

Nearly all the results of tests are so largely dependent upon the skill and the personal equation of the operator manipulating the testing-machine that very naturally much hesitation has been felt in accepting as conclusive the results so obtained. It has been the aim of the author, in the design of the present machine, so to arrange its construction that, as far as is mechanically possible, the machine itself should do its own work, thereby eliminating from the result all personal equation on the part of the operator. One of the greatest obstacles to making accurate tests has been the difficulty of making the axis of stress of the machine coincident with the axis of the specimen. In making experiments on wrought-iron or steel, or upon other materials which are more or less of a ductile character, this objection is not a serious one, as it introduces but a slight error in the results. In experiments on cast-iron, cast-steel, or other materials of an essentially brittle character, the slightest cross stress vitiates the results by introducing stresses into the test-piece that are entirely contrary to those desired, and which produce effects not to be calculated.

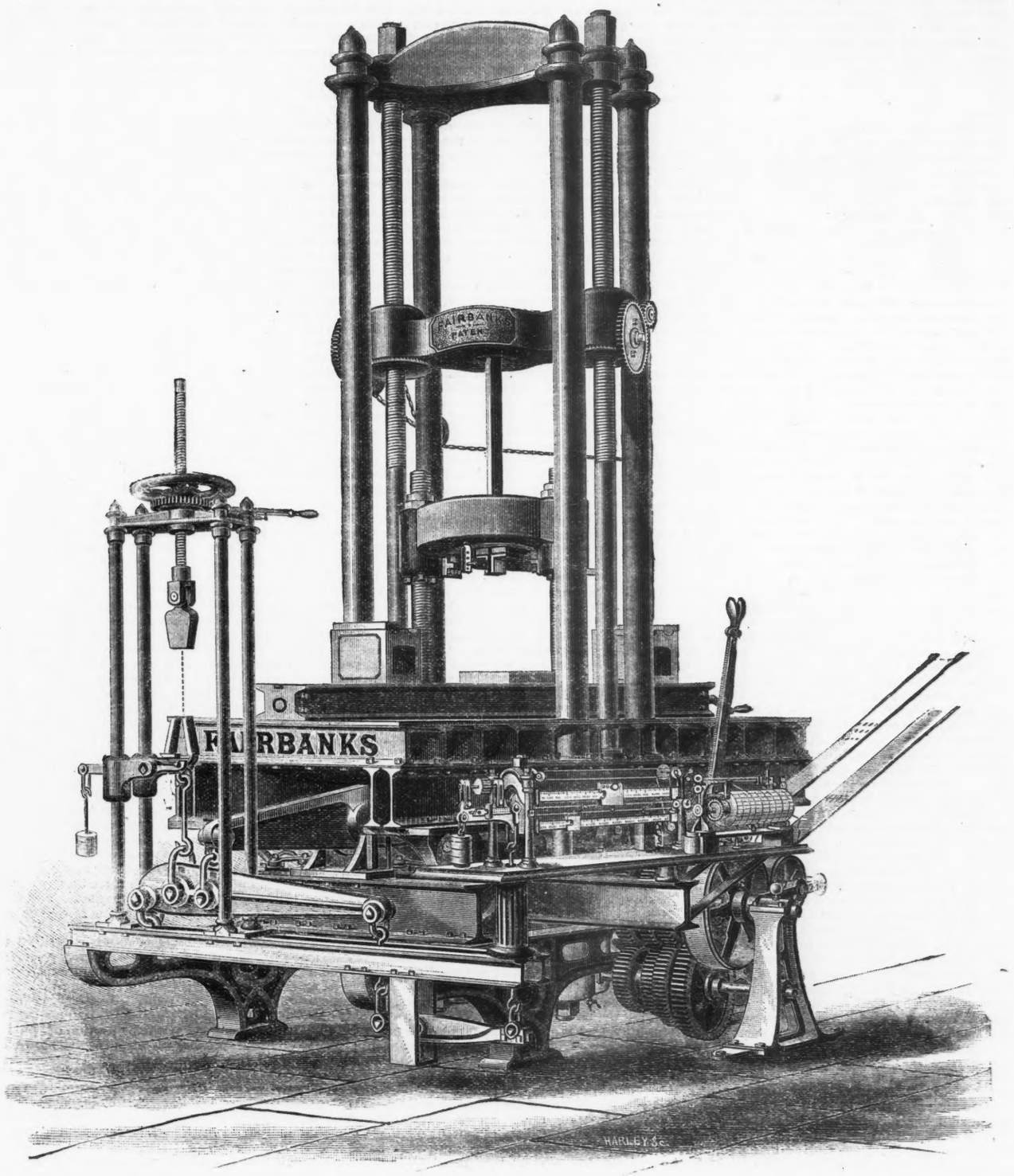



Figure 1.

By referring to Fig. 3, a device for enabling the machine automatically to center the test-piece may be understood. The top and the bottom cross-head have in their centers a large spherical concavity. This concavity contains a segment of a sphere in which the wedges for gripping the test-piece are placed. The spherical segment is made of steel, turned and polished as smoothly as machine work can make it, and the concavity on the cross-head is lined with the best anti-friction Babbitt-metal, reducing as low as possible the coefficient of friction between the sphere and its socket. Let it be supposed that the piece is placed in the machine eccentrically. The first operation, as soon as the screws are turned and the lower cross-head begins to descend, is to produce a slight stress on the piece. This stress comes on the spherical segments eccentrically, and the tendency is immediately to swing the segments in their sockets and cause the axis of stress in the machine to coincide with the axis of the test-piece. The spherical segments in question in the machine under examination weigh about 200 pounds. They are, however, carefully supported on India-rubber springs, so as to eliminate as far as possible the weight of the segment from the friction in its socket. But supposing, under the most favorable circumstances, that the whole weight of the segment does come on the joint, the coefficient of friction is not over 2 per cent.; consequently, a maximum cross-strain of 4 pounds on the test-piece will cause the segment to swing and to adjust itself to the axis of stress through the piece. As this weight of 4 pounds is less than half the least reading of the poise, it may be assumed to produce no sensible effect on the piece to be examined. The most of the testing-machines now in use require a careful preparation of the test-piece previous to an examination. If, for example, it is wished to ascertain the strength of an I-beam or a channel, it is necessary to send the shape to the machine-shop and plane out a piece. This requires much time and quite an outlay of expense. The piece is then sent to the testing-machine and broken, causing an additional expense; and after the result is accomplished, what is obtained? Simply the result of a piece cut from the shape, which may or may not give a fair knowledge of the actual strength of the member in question. What is wanted to be known at the present time is, not the strength of a carefully prepared test-piece, broken under special circumstances, but of the actual bar, just as it comes from the rolls in the mill itself. Engineers want to know the strength of an I-beam, the tenacity of a channel, the cohesive strength of an angle, the compressive resistance of a post, actually of the pieces themselves, and not a calculated result to be obtained by cutting from the shapes in question a test-piece and figuring the possible result of the whole shape. It has been the aim so to arrange the testing-machine that full-sized shapes of any description could be placed therein and broken without any preparation whatsoever. The advantages of this are very obvious; for it not only saves the cost and time necessary to prepare the test-piece, but also gives the desired knowledge of the strength of the full-sized shape. A well-known example of the desirability of this may be quoted from the experience of Captain Eads in the St. Louis bridge. Test-pieces of the steel bolts stood in the testing-machine a stress of 90,000 pounds to the square inch. Some circumstance caused Captain Eads to suspect that the bolts themselves would not reach that quantity; and after building a testing-machine especially for the purpose, it was found that the bolt broke at something like 40,000 pounds. If the St. Louis bridge had been build on the 90,000 pounds supposition, there would have been one more instance in the long catalogue of engineering disasters.

The spherical segments in the cross-heads of our testing-machine have four sides inclined at an angle of about 12 degrees to the axis of the machine. Two of these sides are curved and two are straight. By using a number of wedges with sides correspondingly curved or straight, any piece of whatsoever section may be completely surrounded by the wedges and gripped on all sides, so that a channel, an angle, an I-beam, a T, or a star, or indeed any of the shapes now rolled in the mills, may be placed in the machine and broken in full size.

In making the designs for this system of testing-machine, much time and labor have been spent to accomplish the third qualification introduced at the beginning of this paper, as necessary to a testing-machine, namely, the power of autographically recording, at each instant of time during the experiment, the amount of stress and the strain produced thereby on the specimen. To the best of the author's knowledge, Professor Thurston, of the Stevens Institute, was the first to originate the idea of making a testing-machine in such a manner as to record graphically on a sheet of paper the result of the test. In 1876, at the Centennial Exhibition, Professor Thurston exhibited a machine designed to make tests in torsion and to record the action thereof. As a matter of history, it may be stated that, while engaged in examining material for the East River Bridge, in 1877, the author designed and built the first machine to autographically record results of the experiments in other stresses than that of torsion. While this machine, being the first of its kind, was necessarily crude and imperfect, it gave for some years very satisfactory results, and is still in use by the Bridge Company.

Referring to Fig. 3 (the cross-section of the machine), it will be seen that one pole of the battery $G$ is attached to the top of the adjusting-screws $h$, $h$. These screws are carefully insulated from the rest of the machine, all standing on a rubber base and passing through an India-rubber bushing, held in the interior of the top casting; consequently, these screws, with their corresponding cross-head, are electrically insulated from the rest of the testing-machine, and, being joined to one pole of the battery, form the only means by which the current can flow into the machine itself. As soon as the test-piece is placed in the top cross-head, it becomes thereby connected with the battery. On the lower end of the specimen, may be seen a small clamp, carrying an electro-magnet. One end of the wire of this magnet is in connection with the specimen, while the other end of the wire is joined to a little binding-screw on top, to which the other pole of the battery is attached, so that the current actuating this magnet flows from the test-piece under examination. It will also be seen that the magnetic clutch $K$ for holding the driving-belt on the tight pulley is also included in this part of the battery circuit. As long as the specimen remains intact, the current flows from the battery, excites the two magnets, and attracts their armatures. When the rupture of the test-piece occurs, the current is at the same instant broken, the magnets are demagnetized, the clutch is released, the belt slides by means of the counterpoise weight by means of the loose pulley, and the testing-machine stops. On the top of the specimen nearest to the upper cross-head, is attached a second clamp, carrying a small sheave or pulley. Around this pulley, parallel with the specimen and attached to the armature of the lower clamp magnet, passes a flexible steel tape $y$.

Referring to Fig. 4, an enlarged view of the specimen and clamp with its magnet may be seen. Here it will be noticed that the tape, after passing along the sides of the specimen, runs down to a pencil or stylographic pen that is carried on a sliding track, placed over a metal cylinder, carrying a sheet of cross-section paper. It is at once obvious that, as fast as the specimen elongates under the action of the stress, the pencil is drawn along the ways of the cylinder, parallel with its axis. This axis (the axis of $X$ of analytical geometry) is assumed to be the axis of elongation. Inasmuch as the cross-section of the tape is very large in comparison with the friction of the pencil-carriage and the supporting pulleys, the tape itself is subjected to comparatively little stretch, and is always kept tight and in its place by means of a counterpoise weight; consequently, every deformation of the specimen is accurately recorded on the cross-section paper by a corresponding motion to and fro of the pencil. In actual practice, it may be said that the record on the cross-section paper corresponds within 1-100th of an inch to the elongation measure of the specimen, and this for ordinary experimental work is sufficiently near. An enlarged view of the clamp with its magnet may be seen in the figure. It will be noticed that the clamp is supplied with a spring and screw $w$. The screw is employed for securing the clamp to the specimen, and the spring serves to take up any reduction in area caused by the drawing down of the piece and to constantly keep the clamp tightly secured in its place. Next to the magnet, the side of the clamp is supplied with two edges, one rounded and one sharp; the sharp edge slightly indents itself in the specimen and secures the clamp rigidly in its place and forms a zero mark from which the percentage of stretch may be readily calculated; while the rounded edge prevents the clamp from rocking and at the same time allows the piece to stretch freely. The top clamp is made in a corresponding manner, and the sharp edges of both are placed next to the jaws of the cross-head. Consequently, it is very rare that a specimen can break outside of these knife-edges, which form datum marks of reference from which the per cent of elongation may be recorded. The autographical record of the deformation of the specimen is by this means made plain. It now simply becomes necessary to record at the same time the stress producing the deformation. Turning to Fig. 5, an enlarged view of the beam with the registering cylinder may be obtained. From this illustration, it is perceived that the beam is composed of two parts, a top bar and a lower bar, each carrying its appropriate poise. The large poise is ten times as heavy as the small one, consequently the small one must move ten times as far as the large one and produces a corresponding effect on the scale. The entire travel of the small poise is equivalent to a weight of 10,000 pounds in the testing-machine, while the entire travel of the large one is equivalent to the entire capacity of 200,000 pounds. On the end of the beam, will be seen two mercury-cups, 16 and 17. The skeleton view of the beam with its apparatus, shown in Fig. 8, may perhaps render this a little more obvious, and should be consulted at this time. From the lower cross-head of the testing-machine, which, it will be recollected, is connected with the specimen carrying the current, the electric force flows into the butt of the beam. The two mercury-cups at the end of the beam are so arranged that, when the beam is in the center, neither cup is included in the electric circuit, which is consequently broken. If the force on the platform increases, the beam rises and the upper cup is brought into the circuit, and the electric current begins to flow. Should the weight in the testing-machine decrease, the beam falls into the lower cup, and the electric circuit is also completed through that one by the drop of the beam. It will be seen that the lower poise on the beam is connected by means of the steel tape with a little countershaft $r$. This countershaft is joined by an open and closed belt and two magnetic clutches $t^4$ and $t^5$. These clutches are placed upon the shaft that is driven by the clock-work $t$. When the beam rests, the magnetic clutch $t^4$ is excited by the completion of the circuit through the mercury-cup 16. As a consequence, the small poise is immediately drawn out along the beam, tending to rebalance it. Should the motion of the poise equal the weight on the platform, the beam then sinks to the center, the circuit is broken, and the poise stands still. If, from any cause, the force on the platform decreases, the beam drops into the lower cup, the magnetic clutch $t^5$ is excited, the cross-belt $p^2$ begins to move, and the poise is moved backward on the beam, tending again to rebalance it.

Returning to Fig. 5, a small switch will be seen at 21, so placed that, when the small poise reaches the maximum extent of its travel, it strikes against this switch, and automatically closes the electric circuit, through the magnet $o^3$. The effect of this circuit is to excite the magnet, release the large poise $q^1$ and cause it to move out 1-10th of the travel of the large beam, which is exactly equivalent to the total travel of the small poise on the lower beam. Instantaneously with the motion of the large poise, the beam superweighted drops, closing the circuit in the lower cup, and returns the small poise to the butt of the beam. It is thus plain that the rise and fall of the beam absolutely control the motion of the poises, and the beams form an automatic shunt for so circulating the electric current as to cause the poises to move to and fro. This motion of the beam is entirely dependent on the pressure exerted on the platform, so that it is obvious that, the piece being placed in the testing-machine, the weighing may be done by the machine itself automatically in a way far more sensitive and accurate than is possible to accomplish by any hand-labor, however skilled. In order to accomplish the registration of the motion of the poises, which is all that is necessary to record the stress on the specimen, the cylinder previously mentioned is magnetically connected with the shaft $r$, so that, as fast as the poises travel out, a worm-gear connected with a magnet on the cylinder causes the cylinder to revolve circumferentially, thus making the axis of $Y$ the axis of stress. The motion of the pencil, as has previously been shown, records the deformation of the specimen, while the motion of the cylinder, as is now plain, records the motion of the poises, by so proportioning the pitch of the worm-gear that an inch on the circumference of the cylinder corresponds to a definite number of pounds on the testing-machine. It becomes an easy matter to read from the motion of the cylinder the amount of force which has been applied to the specimen; consequently, the curved line that is marked on the cross-section paper, by the combined motion of the pencil under the influence of the tape and

of the cylinder gives a record whose abscisses and ordinates are measures respectively of the stress to which the piece is subjected and the resulting strain. As soon as the piece breaks, the current which actuates the motion of the testing-machine, the motion of the tape, and the motion of the cylinder is ruptured. The machine stops, the beam falls, the poise stands still, and the pencil comes to rest, leaving the record on the cross-section paper for any future inspection.

The preceding method of obtaining autographic diagrams possesses many advantages for adapting it to testing-machines that are to be built especially compact. There is, however, another method of obtaining the same results, whereby the registering cylinder may be located at any distance from the testing-machine. In Figs. 7 and 11, are two photo-engravings from the beam and registering-cylinder employed in the Department of Tests and Experiments. In Fig. 7, it will be seen that the beam consists of a single bar suspended on a stand at one end and inclosed in a guard at the other, while on this beam there rests a semicircular brass box, forming the poise. Along the top of the beam, there is cut an exceedingly fine rack, and the motion of the poise is obtained by a pinion placed inside of the box and gearing into this rack. At the end of the beam, may be seen the mercury-cups alluded to in the former method for making the electrical connection as the beam rises and falls. The operation of this piece of apparatus is substantially as follows: The clock-work motor for driving the poises to and fro on the beam is connected with the mercury-cups by means of some brass strips placed in the rear of the steel bar forming the beam. These strips are connected with two electro-magnets on the inside of the poise; consequently, when the beam rises or falls, one or the other of the magnets is excited, the corresponding train of clock-work is thrown into action, and the poise quietly rolls to and fro until a balance is re-established. This part of the apparatus—that is, the accomplishment of the motion of the poise to and fro on the beam—is exceedingly simple, the knotty part of the problem being to correlate the motion of the poise with the motion of the cylinder exactly, so that, in the given travel of the poise along the beam, the cylinder may move a corresponding quantity. Of course, the ratio between the two movements is simply a matter of proportioning so as to accommodate an ordinary cross-section sheet to the circumference of the cylinder; for it will be readily seen that an exact and constant ratio is a very important point. To solve this problem was to accomplish the solution of one analogous to that presented by the autographic telegraph, the electric clock, and similar pieces of mechanism, but with some peculiar features arising only in this special instance. To go a little more into the details of the poise, there are inside of the brass box two large wheels, about 8 inches in diameter. The wheel placed on the front of the poise is graduated with a series of numbers. The pinion carrying the poise along on the beam is an inch in circumference, and consequently a single revolution of the pinion carries the poise one inch along the beam. The wheels are secured directly to the pinion-shaft, so that there can be no back-lash between them, and being 8 inches in diameter, one revolution of the pinion causes these wheels to travel 1-25th of an inch of circumference. In the testing-machine in question, a motion of one inch along the beam corresponds to a weight of 4000 pounds in the testing-machine! The front wheel, which is graduated as a dial, being 8 inches in diameter and subdivided into 400 parts, each of these parts corresponds to 10 pounds in the testing-machine. The rear wheel of the poise is constructed in precisely the same manner as the front wheel, excepting that the marks on the dial are replaced by little strips of India-rubber, so that the wheel presents a series of teeth, alternately made of India-rubber and of brass. On the front of this wheel, there presses a brass commutator-strip, so arranged as to include the cylinder in the electrical circuit. As soon as the poise begins to move along the beam, this wheel, with its India-rubber spaces, begins to turn under its commutator-strip, and with every passage of a tooth under the strip, a flash of electric force passes into the cylinder. Turning to Fig. 9, a detailed drawing may be seen, taken directly from the working drawing of the cylinder. Here it may be observed that inside of the cylinder are two toothed wheels. Each of these wheels is mounted on the central shaft, and is capable of being ratcheted around by means of a little lever arm and pawl that is operated by a magnet placed directly under each of the wheels. One of these wheels is intended to drive the cylinder in one direction and the other in a contrary. One electro-magnet is connected with the mercury-cup on the bottom of the beam, and the other with the mercury-cup on the top. As a consequence, as soon as the beam makes connection with either cup and the poise begins to travel, the corresponding electro-magnet is excited, the armature acts and begins to ratchet the wheel around, thus, by means of the connecting gears seen at the extreme right hand, moving the cylinder in one way or the other. It will thus be seen that, if the gears in the cylinder are properly proportioned and accurately cut, and if the magnet makes a stroke for every tooth on the insulated poise-wheel, the cylinder will be moved through an amount that is exactly commensurate with the motion of the poise itself. At first sight, it would seem that so accurate an arrangement would be almost impossible to construct; yet so it is with all of our machines, and nobody despises a Swiss watch or a micrometer-gauge from the possible difficulties in its manufacture. In the case in question, it has been found that an entire revolution of the cylinder may be made to correspond with the complete travel of the poise along the beam within a possible error of 1-100th of an inch. Now, if we allow the strip of cross-section paper to be 40 inches long, and giving a stress reading of 4000 pounds to the square inch, 1-100th of an inch corresponds to 40 pounds! Inasmuch as this is the least practical reading to be made on cross-section paper, and as it is four times as large as the smallest reading of the poise, it will be seen that this error of 1-100th of an inch in the entire travel of the cylinder is too small a one to be taken into any practical account. On the top of the cylinder, there may be seen a track carrying a carriage and pencil, connected with the specimen by means of a steel tape in a way precisely similar to that used in the method previously described. Between the motion of cylinder and the poise, it will be noticed that there only exists the same connection as occurs between any two telegraph stations; consequently, if it be desired, the machine may be placed in New York and the registering cylinder in Cincinnati, and the two work absolutely in harmony with each other. Therefore, should it ever be deemed expedient, the cylinder may be inclosed or locked up in a way to be absolutely exterior to any control on the part of the operator manipulating the testing-machine. An old proverb has said that "the proof of the pudding is in the eating;" and now in Fig. 12 may be seen a photo-engraving made from a sheet of cross-section paper, on which, by means of the last method in question, have been drawn a half-dozen curves corresponding to as many test-pieces. In this particular sheet, in order to economize space, the vertical scale along the axis of $Y$ or axis of stress has been made 10,000 pounds to the linear inch, while the distances along the axis of $X$ or axis of stretch—for all the tests here were recorded as made in tension—are the normal stretches of the pieces under examination.

The cross-section paper has been ruled in feet and decimals of a foot, and each of the specimens was one foot between the stretch-clamps; consequently, the actual stretch of the specimen may be at once read in comparison of length. The lower half of the sheet contains three steel curves, which it will be readily seen bear to each other a strong family resemblance. In the first place, the curve begins with a line slightly inclined to the axis of stress at a constant tangent, or one which may be

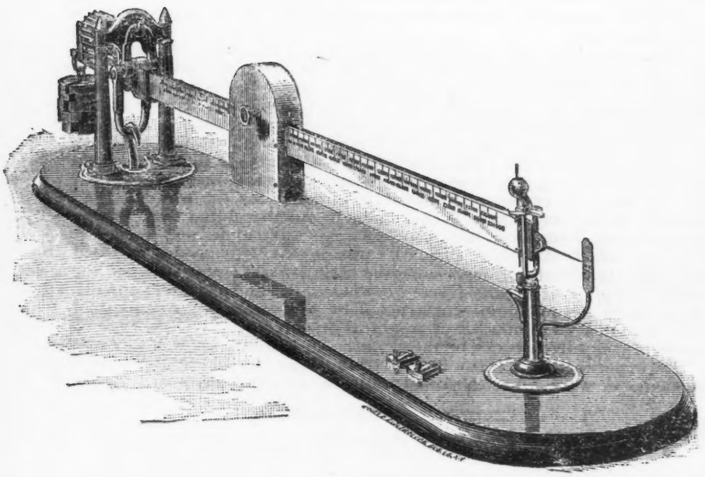


Figure 7.

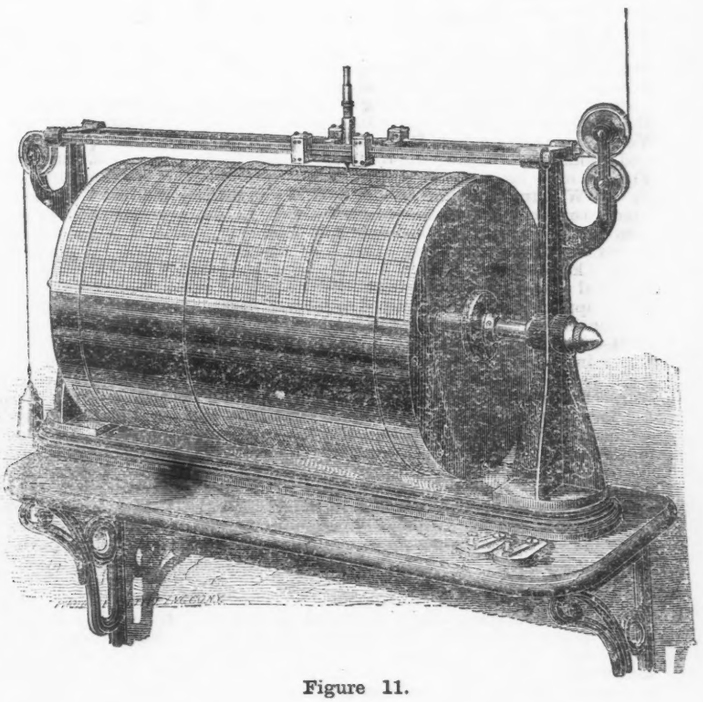


Figure 11.

expressed by the equation $y = ax$. As soon as the elastic limit is reached, a sudden point of inflection occurs; the tangent becoming nearly or quite parallel to the axis of $X$. Very soon, however, a second point of inflection occurs; the tangent returns nearly or quite to its former inclination, and the curve takes on a general parabola form. In fact, nearly all steel curves are cubic parabolas of one form or another. The steel curves, as well as that given by the specimen of Ulster iron, may be taken to be typical forms or curves, to be obtained from a material which is nearly or quite homogeneous. Here it will be seen that the lines are quite true and regular, and that the curve proceeds over the cross-section paper without any special irregularities until the maximum stress is reached shortly before the specimen breaks. The stress then begins to decrease, owing to the rapid reduction of area of the piece under the action of the machine; and with the reduction of the stress, the curve drops and returns toward the axis of $X$, until very shortly the specimen is ruptured and the apparatus comes to a stand-still. The other three curves, given by a piece of boiler-plate and of two specimens of muck-bar, are very good examples of the value of the autographic method of giving a practical indication of the molecular construction of the material to be experimented on. As is well known, both boiler-plate and muck-bar are decidedly non-homogeneous, and as a result we have curves here that are exceedingly irregular, especially after passing the elastic limit. While they bear a general resemblance to the previous ones, they are full of points of inflection, turning and twisting about and giving one an idea that the specimen consisted of a bundle of threads or fibers that gradually parted under the action of the stress, giving any thing but constant and uniform action. For a general record of the test, it is believed that the autographic method is superior to any thing else. At the same time, it is not sufficiently refined for accurate investigations into the limit and modulus of the elasticity, inasmuch as it is impossible to read on the cross-section paper nearer than about 1-100th of an inch, and inasmuch as any arrangement to magnify the stretch up to the elastic limit would give the elongation after passing that point such dimensions as would carry it far beyond the capacity of any sheet of cross-section paper now to be obtained in the market.

The autographic diagram will give the limit within a thousand pounds to the square inch, and the modulus within a hundred thousand pounds. Yet, for many purposes, it is very desirable to know these quantities, and obtain a nearer approximation to these quantities, and in Fig. 10 may be seen an illustration of a piece of apparatus, devised by Col. William H. Payne, of the East River Bridge, and used by him there in experiments on the steel to be used in the trusses. It will be seen that the apparatus consists of two steel bars $A$ and $B$, so arranged as to slide parallel with each other. At the ends, each bar is supplied with a knife-edge $F$, held in a solid piece of brass $M$, which may be adjusted at any point on the bar. By means of these knife-edges, the whole apparatus may be clamped to the specimen by use of the springs $G$. On the bar $A$, a small steel projection $O$ bears against one of the knife-edges of a multiplying lever $C$, and the other end of this lever comes in contact with a supplementary vernier and scale $D$ and $E$. Now, as the piece under examination elongates, the bars move by each other, the multiplying lever $C$ turns on its fulcrum, pushing the vernier $D$ outward along its scale. Thus it is obvious that the whole apparatus, after being placed on the specimen, works entirely without intervention from the operator. In the case of micrometer-screws, it becomes a pretty difficult matter for the same person to make readings twice alike, on account of the varying coefficient of friction and of the varying personal equation; and again the operation of making readings with micrometer-screws is exceedingly slow, and should, as in the case of hydraulic machines, the pressure have any tendency to relax, it is almost impossible to obtain a correct reading; whereas, in the gauge in question, the reading may be made as fast as the eye can gauge the coincidents between the vernier and the scale. While making many thousand steel tests for the East River Bridge at the works of the Cambria Iron Company, the author used this gauge, and, employing one man to place the weights on the beam, was accustomed to sit where the vernier of the stretch-gauge could be seen, and, at the moment that the beam rose, to catch the reading of the scale. Thus the entire operation of making a test on a bar one foot long and an inch square, including the making of some twenty or thirty readings, did not occupy more than from eight to ten minutes, which is a speed never to be attained by any arrangement of micrometer-screws. By means of the extension-rod and clamp $L$ and $M$, the sliding-bars of this piece of apparatus may be extended to any desired length, and by this means it becomes an exceedingly valuable instrument in the investigation of the strains which occur in structures already existing, such as bridges, roofs, and the like. As a case in point, may be mentioned an examination of a case by the author at the opening and test of the new cantilever bridge at Niagara. Two gauges were employed at the test of the cantilever, vernier $A$ being secured to a tie-bar on the truss extending over one panel, and vernier $B$ attached to a bar extending over two panels from the anchorage end of the cantilever on the American side. Vernier $A$ extended over a distance of 4·75 feet, and vernier $B$ over a distance of 5 feet on the bars. Readings were taken at the various points at which the loading trains came to a stand, and gave the extensions produced by a quiescent load. During the movement of the trains, the verniers fluttered a little, showing that, even at slight speed, there is a sensible effect from shock; and as the loaded train moved off on the American side, there was a negative reading of about 25-100,000th of a foot, showing that the bar was undergoing a slight compression. The following are the readings of the verniers, reduced to a length of one foot of bar:

| | | | |
|---|---|---|---|
| Train at the Canadian abutment | Vernier A, | 10-100,000 | of a foot. |
| | " B, | 12-100,000 | " " |
| Train at Canadian tower | " A, | 74-100,000 | " " |
| | " B, | 72-100,000 | " " |
| Train at Canadian end of center span | " A, | 106-100,000 | " " |
| | " B, | 132-100,000 | " " |
| Train at American abutment (giving the maximum strains in the bars under examination) | " A, | 165-100,000 | " " |
| | " B, | 212-100,000 | " " |
| Center span, entirely loaded | " A, | 106-100,000 | " " |
| | " B, | 102-100,000 | " " |

Bridge unloaded, verniers returned to zero, assuming the modulus of elasticity of the I-beams, the following stresses per square inch are obtained from the preceding measurements:

| | |
|---|---|
| Bar extending over two panels | 6780 pounds. |
| Bar extending over one panel | 5280 " |

According to the strain obtained from the bridge engineers, the maximum load in the long bar should be 7190 pounds, thus giving a difference of only 400 pounds between the calculated load and the load obtained by these gauge measurements.

In conclusion, a word as to the practical accuracy of the lever testing-machine may not be out of place. The machine under consideration has been subjected to severe use for a period of nearly two years, during which time its sensitiveness, even when loaded, has not decreased to the least reading on the poise. From this and from long practice in similar scale-work, it may be safely stated that a testing-machine, with proper care, may have an exceedingly long life. The attainment of absolute accuracy in any department of investigation would, if it were possible, be an extremely desirable result; yet even our best experiments are simply close approximations to the truth, and I think it will be granted that it is desirable to make all our improvements commensurate toward an absolute standard of accuracy. It is of no importance to carry the accuracy of the weighing-beam beyond the possibility of the measurement of the bar. Suppose the tests most frequently made to be those on specimens having about a square inch of cross-section. In a piece of iron of this size, an error of measurement of 1-1000th of a square inch of cross-section corresponds to a possible inaccuracy in the ultimate calculated stress of the bar of 50 pounds; while the corresponding quantity in the steel bar corresponds to about from 70 to 90 pounds. There are very few lathes in the country in which it is possible to turn a bar so exactly that it shall be perfectly round and that there shall be no variation from one end to the other of more than 1-1000th of a square inch. There are few men capable of manipulating any lathe to produce such a result, and there are still fewer gauges that are capable of measuring even a perfect bar, so as to exclude the possibility of an error as great as 1-1000th of a square inch. Now, if it be impossible to measure the size of test-bars to within an error of from 50 to 100 pounds in the testing-machine, is it of any importance to refine the machine beyond this reading? In the lever system of testing-machines, it is perfectly possible to obtain a machine which shall uniformly and constantly give readings which shall not have a greater variation than from 5 to 20 pounds; and if bars can only be measured to from 50 to 100 pounds, would it not be wiser to spend money in refining measuring instruments rather than in the refining of the testing-machine?

When tests are made on full-sized members, or on bars directly from the rolls, carrying with them the scale and the other imperfections from the mill, the possibility of measuring to a thousandth of a square inch becomes absurd, and even three or four hundredths of a square inch is the nearest approximation that can be made; for example, in making a test on an ordinary eye-bar of say 5 or 6 inches of cross-section, it is certain that the bar has any thing but an absolutely uniform section from end to end; and how long, may it be asked, would it take to measure that bar so that the least cross-section could be obtained for the record? And again, in actual experience, it has been frequently found that, having obtained what is supposed to be the least cross-section, the test-piece may break in a totally different place. I think it will be conceded, without doubt, that practical engineers care very little for test records beyond the hundredths place of figures; and what is wanted at the present time is, not so much the machines constructed on a theoretical refinement of accuracy, but a large number of practical machines so that one may be located in every iron-works in the country, and money enough to carry on the experiments, and to obtain from these machines a practical knowledge of what America's constructive materials really are.

## DUBOIS AND FRANCOIS'S NEW METHOD OF DRIVING.

Dubois and François, who were among the pioneer manufacturers of rock-drills on the continent, are bringing out a new application of their machine, which opens a field for it under certain circumstances. The primary object has been to use it for driving levels in fiery mines, avoiding the use of explosives; but they have now tested it also for ordinary work where there is no objection against firing shots. Prof. Paul Trasenter, of Liége, has recently given some details in regard to its work that are encouraging. MM. Dubois and François have arranged their drill carriage in such a way that the drill can be moved continuously along a horizontal or vertical line. In soft rock, they drill a hole at each end of a line and then make a cut between the two holes down to their entire depth. In hard rock, a series of holes is drilled, and the sections between them are taken away by a special bit. As soon as the cut has been made, holes are drilled, and those nearest the cut are fired first. The drill is particularly powerful, having a 12 centimeter (4·71-inch) piston, and drilling holes from 6 to 8 centimeters (from 2·36 to 3·15 inches) in diameter. To make a cut 1·20 by 1·50 meters (3·94 by 4·92 feet), requires one hour in schist and less than two hours in sandstone, while the drilling of the necessary holes takes nearly double the time.

According to the statements of M. Mathet, of the Blanzy mines, when the drill is used in this manner, the system possesses the following advantages. The drilling of the cut reduces the number of holes and the quantity of explosives used. It requires only one strong and comparatively light drill, which needs only the attendance of two or three men, so that the cost of repairs, maintenance, and labor is reduced. By reason of the large diameter of the holes, their number is reduced by at least one half, and as they are drilled more rapidly in consequence of the power of the drill, the advance is faster. MM. Dubois and François have found that, with one of their drills, they can do faster work than with four ordinary drills, and can do it cheaper. In one case, for instance, the cut was 70 francs for the heavy drill, against 110 francs with four light drills, and consequently the single-drill carriage has driven the carriages with four light drills out of the mines at Blanzy, at Villeder, at Morbihan, at Trélys, near Alais, and at Aguilas, Spain. In fiery mines, MM. Dubois and François use the drill as a hammer to drive in wedges in holes previously drilled.

## THE PRODUCTION OF RAILS OF ALL KINDS IN THE UNITED STATES IN 1883.

In January last, says James M. Swank, Secretary of the American Iron and Steel Association, we published the statistics of the production of Bessemer steel rails by the Bessemer steel-works of the United States in 1883, and we are now enabled to supplement this information with the statistics for the same year of (1) the production of Bessemer steel rails in iron rolling-mills from purchased blooms, (2) the production of open-hearth steel rails, and (3) the production of iron rails. These statistics are given in the following table in comparison with corresponding statistics for 1882:

| KIND OF RAILS. | Tons of 2000 pounds. | | |
|---|---|---|---|
| | 1882. | 1883. | Decrease. |
| Bessemer steel rails rolled in Bessemer works | 1,334,349 | 1,253,925 | 80,424 |
| " " " iron rolling-mills | 103,806 | 32,629 | 71,177 |
| Open-hearth steel rails | 22,765 | 9,186 | 13,579 |
| Iron rails | 227,874 | 64,954 | 162,920 |
| Total | 1,688,794 | 1,360,694 | 328,100 |

The production of street rails in 1883 (included in the total given above) was 19,440 net tons, a decrease of 2846 tons upon the production of 1882, which was 22,286 tons. The production in 1883 consisted of 1970 tons of iron rails, 14,499 tons of Bessemer steel rails, and 2971 tons of open-hearth steel rails.

The shrinkage in the production of rails of all kinds in 1883, as compared with 1882, was nearly 20 per cent. This was a larger shrinkage than occurred in 1882, as compared with 1881. We give below the statistics of production of the last three years, premising them with the remark that 1881 was the year of greatest aggregate production of rails of all kinds in our history:

| KIND OF RAILS. | Tons of 2000 pounds. | | |
|---|---|---|---|
| | 1881. | 1882. | 1883. |
| Bessemer steel rails—all sources | 1,330,302 | 1,438,155 | 1,286,554 |
| Open-hearth steel rails | 25,217 | 22,765 | 9,186 |
| Iron rails | 488,581 | 227,874 | 64,954 |
| Total | 1,844,100 | 1,688,794 | 1,360,694 |

The production of rails of all kinds in 1882 was 155,306 net tons less than in 1881, or a decrease of over 8 per cent. Bessemer steel rails increased in 1882 107,853 tons, but iron rails fell off 260,707 tons, and open-hearth steel rails fell off 2452 tons. The total decrease from 1881 to 1883 was 483,406 net tons, or over 26 per cent.

## WIRE ROPE IN ENGLAND.

As the following letter, printed in a recent issue of the *Colliery Guardian*, shows, English mine managers are getting exercised over the quality of the wire rope sold to them:

With the assistance of a friend of great practical knowledge in the manufacture of steel, I have been enabled to collect a few facts that may be of service to my rope-buying brethren, subject to correction by any wire rope manufacturer. From a price-list before me, I will take the different qualities and quotations for a 3-inch circumference round wire rope:

| | Per ton. |
|---|---|
| Charcoal wire of special quality | £20 |
| Homo or Bessemer steel, special quality | 19 |
| Crucible steel wire | 31 |
| Patent steel wire | 35 |
| Improved patent steel wire | 41 |
| Patent plow wire | 66 |
| Improved patent plow wire | 72 |

Rope to be made of six strands, seven wires to each strand, and hemp main heart.

At different times, I am favored with calls by gentlemen representing the different manufacturing houses, and taking the above-quoted prices as a stand-point, I find a difference ranging from £10 to £20 per ton, no two firms quoting alike. On expressing surprise, I am given the most extraordinary explanation: No. 1 asserting that his house is the only one that can make a reliable wire rope; No. 2 claiming a special lay or twist; No. 3 engages a special steel-maker and a special wire-drawer; No. 4, a new and patented class of machinery; and so on, *ad infinitum;* whereas, the fact is, there are no specialties claimed by one maker that can not be obtained by another. I believe the entire trade is worked by rule of thumb, and the order given to each representative is to get the best price he can. Returning to the quotation: First, charcoal wire. I am told by most makers that charcoal wire is scarcely ever used, mild Siemens-Martin steel taking its place. Assuming this to be correct, I fancy the latter material is by far the best; provided the wire is rolled and drawn down from special ingots. A 3-inch circumference rope takes a No. 12 gauge wire, Siemens-Martin steel wire. Special quality of this size can be bought at £16 per ton, and taking the rope at £20 per ton, we have as follows:

| | Per ton. |
|---|---|
| Cost of making rope, loss, rents, etc. | 40s. |
| Average carriage for delivering the rope | 25s. |
| Discount upon payment of account at 2½ per cent | 10s. |
| Traveling expenses, etc., at 5 per cent | 20s. |
| Profit and loss account, at 10 per cent | 40s. |
| | 20)135 |
| | £6 15s. |

Add this amount to the £16 charged for the wire, and we have £22 15s. It will naturally be asked, How is this difference made up? A Scotch firm of manufacturers advertises as follows, "When you ask for Glenfield Starch, see that you get it;" but when a colliery owner asks for a steel wire rope of a certain quality, is he certain that he can get it? I have not the slightest doubt that the rope is made of a certain number of steel wires standard quality and a number of wires of a very much cheaper quality, so as to get the price right. I therefore conclude that a manufacturer honest to himself and strictly honest to the buyer can not supply a rope of this quality for less than from £22 to £23 per ton. In homo or Bessemer steel ropes, if makers will only buy wire rolled and drawn from special ingots, from £20 to £21 per ton is a fair price.

Crucible steel wire. It is at this stage "see that you get it" begins to be doubtful. Makers of rope wire charge from £31 to £32 per ton for their wire. Still the ropes are sold at the same price as is paid for the wire, showing a loss to the rope-maker of £6 15s. per ton. Patent steel wire is worth £34 per ton. The rope is sold at £35, showing a loss to the maker of £5 15s. per ton, unless we are gammoned into taking improved patent, which is the same thing, then a respectable profit is obtained. Plow steel wire—prices for ropes range from £66 to £94 per ton, according to the gullibility of the buyer. The average price of the wire being £56 per ton, I am not at all surprised at rope-makers being so eloquent in favor of plow steel, as it seems to be the good fairy with the golden wand, helping to make good losses incurred on the lower qualities. What are the inferences to be deduced from the above? namely, that a very large amount of inferior material is used in the manufacture; that imposition and deception are rampant; and that this is brought about by reckless competition. The wonder is, that disaster is not one hundred-fold more than at present; property, no doubt, suffers severely, but this is generally hushed up—a golden salve curing numerous daily losses. I have it on the best authority that the instructions given to many representatives are to get the best price they can, but never to miss an order. Whatever another firm offers, undercut it; we can make up the difference with inferior material, and chance it.

## THE NEW YORK METALLURGICAL WORKS.

We had occasion recently to pay a visit to the well-equipped New York Metallurgical Works, of which Mr. E. N. Riotte, who is well known in mining circles, is manager. The shop is 100 by 50 feet, is well lighted, and affords ample room for the work of testing and assaying ores. There are a rocking-chair battery of two 600-pound stamps and a one-stamp battery, both arranged for wet and dry crushing. A Frue vanner, with a six-foot by 18-inch belt, is used for making experiments in the concentration of ores. Besides a sampling-mill, there are, for crushing, three of the well-known Lucop & Cook pulverizers. For amalgamation, there are a three-foot and a two-foot pan and a five-foot settler. For roasting, a rotary cylinder is provided, with a fire-place at each end. The works are equipped with four furnaces for smelting ores and bullion, three assay-furnaces, three cupelling-furnaces, and a laboratory. The machinery is driven by an 8 by 10 horizontal engine. A feature of the establishment is the variety of scales, there being eight of them, from the Fairbanks platform scales down to Oertling and Toemner balances for the finest work.

Mr. Riotte has, during the past year, devoted a good deal of attention to the question of parting bullion by electrolysis, and he showed us the plant and explained the plans matured by him. The silver bars are hung in diaphragms made of biscuit or unglazed porcelain brought from Germany, this material having proved better than the leather and wooden diaphragms hitherto proposed. These cells are connected in series, and form the anodes; the cathodes being copper plates or gas-coke. The solution, containing free sulphuric acid and the salts of silver and copper, is siphoned out of the last anode cell, and is heated continuously by passing through a cylinder containing 80 feet of lead pipe, coiled, through which live steam flows. The solution is then conducted into the silver precipitating-tank, in which is hung a series of diaphragms made of hard rubber pierced with many fine holes. These diaphragms are filled with electrolytic copper in suitable form. The solution enters the tank at one end, and, flowing by the diaphragms, issues forth at the other end. The largest proportion of the silver is, of course, precipitated at the points nearest the inflow of the solution. From time to time, the nearest diaphragm is taken out and the others moved forward, so that the freshly charged diaphragms are gradually advanced in a direction opposite to that of the flow of the solution. After being thus deprived of its silver, the latter is run into another tank in which the copper is precipitated with iron sponge. The solution is then pumped back into the tank that supplies the cathode cells. In the latter, the iron is to be precipitated by the current, and the sulphuric acid thus regenerated.

A very interesting addition to the plant has been made by Mr. Riotte, in the form of a storage battery of Faure elements, which is used for storing the surplus energy of the dynamo machine and for increasing the resistance when necessary. Mr. Riotte uses a Lumly & Levy dynamo, which he pronounces superior for the purpose to the well-known Weston machine.

REWARD FOR AN INVENTOR.—The Senate has passed a bill appropriating $200,000 to Col. A. H. Emery for the invention and construction of a machine for testing iron and steel.

## FURNACE, MILL, AND FACTORY.

The Falcon is the only one of the blast-furnaces of Brown, Bonnell & Co. in operation. The product is used at the mills of the company.

The Forest City Iron-Works of Atkins & Clark are again in operation, with good prospects of a steady run.

The new nail factory of the Sharon Iron Company has begun operations. The greater part of the sixty machines are running. When in full operation, the factory will have a production of about 350 kegs a day. Every department of the Sharon Iron Company is in full operation, the puddling department running double turn.

The Roberstown rolling-mill, Pa., has resumed work after a lapse of two years of idleness. The Franklin Iron Company (Limited) is the title of the new company formed to carry on the work.

The Thomas Iron Company is making preparations to blow in one of its stacks that has been idle for about six years.

It is reported that the rolling-mill at Port Clinton, Pa., will be started up again in a few weeks. The mill has been idle for nearly two years.

The Ries sheet-iron mill at Newcastle, Pa., which has been idle for several months, will resume operations on March 17th, giving employment to 400 men.

A decree foreclosing certain deeds of trust on the property of the Steubenville Furnace and Iron Company has been granted. There is an unpaid balance of bonded indebtedness amounting to $45,000.

Thomas R. Reeve, Novelty Iron-Works, Cleveland, Ohio, has made an assignment to E. J. Leightonall. He has been many years in business in Cleveland, and also owned the Union Iron-Works at Clinton, Iowa.

The order made by Judge Spear in the case of the application of the Cleveland stockholders of Brown, Bonnell & Co. to compel officers of the corporation to file a schedule of assets and liabilities, has been complied with. The condition of the company January 15th, 1884, shows bills receivable, $60,446 ; accounts receivable, $154,857 ; cash on hand, $18,034. Inventory of stock on hand, 29 parcels of land, 2 blast-furnaces, 6 rolling-mills, and other buildings and machinery works, all in Youngstown. In the list of creditors, the largest account is $102,000 ; smallest, 75 cents ; total, $1,283,228. Of this account of the indebtedness of Brown, Bonnell & Co., $601,817 is collateral indebtedness caused by the company indorsing the paper of Herbert C. Ayer and others ; amount due judgment creditors, $718,274. In the list of stockholders, the largest are : Herbert C. Ayer, holding stock valued at $900,300, and Amasa Stone, $160,000. The court has appointed Theodore Hall, of Ashtabula, as referee to hear testimony in reference to the business transactions of this firm the past three years. T. H. Matthews, president of the company, and until recently manager and acting agent for the receiver, will move to Chicago, and be connected with the firm of Deering & Co.

The firm of Park, Brother & Co., the steel manufacturers, has been dissolved, and in its stead the firm of Park, Brother & Co., Limited, organized. The partnership papers have been placed on file in the county recorder's office, with the deeds conveying the real estate, machinery, mill property, and thirteen acres of land on Herr's Island, Eighth ward, Alleghany, from the old to the new firm. The capital stock is fixed at $2,000,000, divided into 4000 shares of a value of $500 each, paid up in cash and real and personal estate. There are ten partners : Sarah G. Park, executrix and trustee of the late James Park, Jr. ; Richard C. Gray, William G. Park, David E. Park, James H. Park, D. C. Clapp, George H. Clapp, and Charles E. Clapp, of Alleghany County ; W. S. Kennedy, of Lancaster County ; and R. G. Park, of Mont Clair, New Jersey. The stock is divided as follows : Estate of James Park, Jr., deceased, 831 shares, $415,000 ; Richard C. Gray, 1000 shares, $500,000 ; William G. Park, 600 shares, $300,000 ; David E. Park, 400 shares, $200,000 ; Richard G. Park, 334 shares, $167,000 ; James H. Park, 334 shares, $167,000 ; W. S. Kennedy, 334 shares, $167,000 ; De Witt C. Clapp, 147 shares, $73,500 ; George H. Clapp, 10 shares, $5000 ; Charles E. Clapp, 10 shares, $5000. The officers are : Chairman, William G. Park ; Vice-Chairman, D. E. Park ; Secretary and Treasurer, D. C. Clapp ; Managers, William G. Park, D. E. Park, Richard C. Gray, D. C Clapp, W. S. Kennedy, R. G. Park, and J. H. Park.

In the week ended at four o'clock P.M. of Saturday, March 1st, the Edgar Thomson Steel-Works produced 4653 gross tons of ingots and rolled 4110 gross tons of steel rails.

Messrs. Jans & Hartman, blast-furnace engineers, write to the Secretary of the American Iron and Steel Association :

The Franklin Iron Manufacturing Company has, in Oneida County, New York, one furnace, No. 2, 70 feet high and 14 feet in diameter at the bosh, which gave the following results for the third week in February :

| Grade of pig-iron. | Gross tons. | Grade of pig-iron. | Gross tons. |
|---|---|---|---|
| No. 1 X | 223 | No. 3 | 22 |
| No. 1 | 76 | No. 4 | 37 |
| No. 2 X | 120 | | |
| No. 2 | 37 | Total | 515 |

The amount of fuel (coke) used by the furnace was 1·12 tons to the ton of ore. The ore yielded 42·7 per cent of iron. The blast was heated to from 1400 to 1600 degrees, and the heat of the escaping gas varied from 250 to 300 degrees. The company is obliged to cast every four hours, to get rid of the iron, as the cast-house is too small. This hinderance is remedying, and a larger output will follow. It will be noticed that the hight of the furnace is five times the diameter at the bosh, which is a greater proportion than it is usual to give. The low temperature of the escaping gas is caused by this great hight, which in its turn gives the low fuel consumption. This furnace is thoroughly equipped with all the modern appliances, including fire-brick stoves. Smaller boshes, increased hight, and faster driving are the order of the day. Mr. C. H. Smyth is general manager of the company, and Mr. F. W. Thomas is superintendent of the furnace.

A monster casting of an anvil for a 12-ton steam-hammer has been most satisfactorily completed at the Clydesdale Iron Company's works at Holytown, England, and is the largest casting of this kind yet attempted. Its weight, when finished, is estimated to be 250 tons, and the operation of casting this immense block occupied thirty-one hours, during which time a constant stream of fully eight tons of molten iron per hour was kept running into the casting-frame, and the whole of the iron was kept in a liquid state for the thirty-one hours. The hammer is intended for use in hammering steel ingots for the best classes of iron.

## RAILROAD NEWS.

A circular has been issued by the Nesquehoning Valley Railroad Company to their stockholders, informing them that a contract has been entered into with the Lehigh Coal and Navigation Company, the lessees of their road, by which the latter agrees to postpone for twenty years from the 1st of September next its right to terminate the lease by the payment of the par value of the stock, and to pay during that period a rental which guarantees dividends of five per cent annually, instead of seven per cent, as by the present arrangement, terminating on the 1st of September. The circular points out to the stockholders the advantage they will secure by this contract, namely, a fixed income of five per cent upon their investment for a period of twenty years, and informs them that, in order to avail themselves of it, they must signify their desire to do so, and present their certificates to be stamped at the company's office on or before the 1st of May, as the certificates of shares not stamped by that date will be paid at par by the Lehigh Coal and Navigation Company, in accordance with the terms of the lease.

The Chicago, Burlington & Quincy road has met the cut in freight rates to Denver and points west of that city in Colorado, which was ordered by the Western Trunk Line Association to meet the cut made by the St. Louis & San Francisco road.

The report of the Pennsylvania Railroad Company for 1883 shows the following results : Main line and branches, Pittsburg to Philadelphia, entire net earnings were $18,373,360, out of which was paid : rentals to branch roads, $1,602,450 ; interest on bonded debt, $3,248,806 ; State taxes and other items, $1,578,672 ; which, deducted from the net earnings, leaves the net income from the Pennsylvania Railroad division $11,943,432. On the New-Jersey division, the total net earnings were $4,463,332. The payments on account of dividends, interest, and interest on equipment were $5,117,247, leaving the net loss under the lease of $653,915, which, deducted from the net income of the Pennsylvania Railroad division, leaves a balance of $11,289,517.

On the Philadelphia & Erie division, $1,315,738 were netted and paid over to the Philadelphia & Erie Railroad Company as rental. From the balance of net income, as above stated, $11,289,517, the following items are deducted : Payment to managers of trust, created October 9th, 1878, $600,000 ; for purchase of Pennsylvania Railroad Company consolidated mortgage bonds for sinking fund, $280,860 ; for account of Alleghany Valley Railroad Company, $661,010 ; for account of Frederick & Pennsylvania Line Railroad Company, $15,000 ; and to the American Steamship Company for interest on guaranteed bonds and for advances, $180,000 ; which items amount to $1,736,870, leaving a balance to credit of income account of $9,552,647. A dividend of 8⅓ per cent was paid, amounting to $7,530,650 ; leaving the amount transferred to credit of profit and loss for 1883 $2,021,997. The lines owned or controlled by the company west of Pittsburg, operated by the Pennsylvania Company and the Pittsburg, Cincinnati & St. Louis Railroad Company, showed net earnings of $9,085,100, from which deduct rental, interest, and liabilities of all kinds chargeable thereto, $8,261,204 ; leaving a net profit of $823,896. The other lines west of Pittsburg in connection with which the Pennsylvania Railroad Company has assumed liabilities, or which it controls through the ownership of securities, but which are worked through their own individual organizations, showed net earnings $2,069,667, from which deduct rental and interest, $2,187,835, making a loss of $118,168, of which the Pennsylvania Railroad Company was directly or indirectly responsible for $11,227.

The Senate Committee on Public Lands has decided, by a nearly unanimous vote, in favor of the forfeiture of the Texas Pacific territorial land-grant assigned to the Southern Pacific Railroad Company. A motion was then made to restore the land to the public domain, but, pending action, the committee adjourned.

The announcement is officially made from Harrisburg of the granting of a charter to the Reading & Pottsville Railroad Company to construct a line of road to connect with the Pennsylvania's Schuylkill Valley Branch at Reading, and the Pottsville & Mahanoy road at Pottsville. This will give the Pennsylvania road a direct line from Philadelphia to the coal regions in opposition to the Philadelphia & Reading. The president of the new road, Joseph C. Bright, say that the new link will be in running order within a year. The Reading will make a desperate fight to keep its rivals out, and arguments on four injunctions will be heard on the 14th inst.

From the annual report of the Union Pacific, it appears that the aggregate amount of passenger and freight traffic for the year 1883 exceeded the amount for the previous year, the diminished earnings having been caused by a reduction in rates. The total number of passengers carried was 1,185,984, being an excess of 21 per cent, and of tons of freight carried, 2,583,285, being an excess of 23 per cent over the year 1882. In mining products, consisting of metallic ores, lead, bullion, matte, and tailings, and commercial coal, the increase was 137,941 tons, or 30 per cent. The total amount of coal mined by the company amounted to 757,119 tons, being an increase from the same mines of 95,273 tons, or 14·3 per cent over the output of the preceding year. The average cost loaded into cars was $1.40½ per ton, being 5½ cents less than in 1882. The amount of coal sold for commercial purposes was 265,113 tons, being an increase of 10·9 per cent over that of the year previous. This is a fair yearly increase in the supply for commercial purposes. During the past year, the demand was largely in excess of the capacity of the company to supply it, owing to insufficient means of transportation. The mines are capable of producing the full supply for the railroad company and for commercial use of the large district of country penetrated by its main and tributary lines ; but it is evident, from the experience of the last year, that additional equipment will be required for that purpose. During 1883, there were turned out from the company's mill at Laramie 6154 tons of iron rails, and 8,511,137 pounds of bar-iron, splices, spikes, bolts, and nuts. The continued fall in the price of steel rails during the past year had reached a price in June when it was no longer deemed advantageous to re-roll iron rails, and at the expiration of that month the business of manufacturing rails for side tracks and for subsidiary lines of the company was suspended. Since that date, the rails taken out of tracks have been rolled into bar-iron, used in the manufacture of cars, and into material for track fastenings. The sales of company lands in 1883 amounted to a larger sum than in any previous year since the sales were commenced, and exceeded the sales last year by the sum of $2,308,837.82. The total number of acres sold during the year was 1,166,349.39, for the gross sum of $4,081,133.94. The number of purchasers was 3814, who bought an average of 305·8 acres each, at the average price of $3.50 per acre.

## LABOR AND WAGES.

The drivers in all the mines on the Ohio Central road in the Sunday Creek Valley have struck against a reduction from $2 to $1.75 per day. Over a thousand miners are out and will support the drivers.

The miners employed in the Clark vein of the Sloan and Continental collieries of the Delaware, Lackawanna & Western Company have accepted the company's terms of a reduction of ten cents a car. The Lackawanna Iron and Coal Company has made a similar reduction at the Briggs shaft. This drop takes about seventy cents a day from each miner. The mines are worked three days a week at present, and the reduction will be severely felt.

At an indignation meeting at Salineville, Ohio, February 29th, attended by 600 miners employed in the mines of the Ohio & Pennsylvania Coal Company and the Osborn Coal Company, it was resolved to strike, if the operators insist on the miners dealing at the stores of the companies.

A number of workmen employed in the freight-car construction shops of the Pullman Car Company, at Pullman, Ill., have quit work because their wages have been reduced from $1.50 to $1.30 per day.

The miners of the third pool have accepted the reduction, and will resume work at once.

## COAL TRADE NOTES.

### CANADA.

#### PROVINCE OF NOVA SCOTIA.

During the session of 1883, of the Nova Scotia Assembly, an act was passed incorporating a company to construct a railroad from the Intercolonial Railroad to the Joggins Shore. The leading interest served by the construction of this line is the coal. Over eighty seams of coal are displayed on the cliffs of the Joggins Shore, within the limits owned by the Joggins Mining Company. These seams extend easterly in most regular formation for a distance of twenty miles at least, and for ten of these the railroad route is above and with the general strike of the coal, facilitating the opening of collieries anywhere along the line.

The Joggins Coal and Mining Association has recently opened a new slope a mile and a quarter from the docks. The coal cars are transported to the dock and the empties returned by means of an endless chain cable over a double-track road. The capacity of the cable is 1000 tons per day. The slope is driven and thoroughly equipped a distance of 1328 feet. The present capacity of the pit is 400 tons per day.

The Prospect Coal Company's slope is sunk 600 feet. The mode of shipment is a quarter of a mile to the dock by a horse tramway.

The Minudie Coal Company has a slope several hundred feet, with steam pump-

ing and hoisting equipment, coal-sheds, engine-house, etc., and a tramway one mile long to its wharf. Several thousand tons were shipped during the present season. Present capacity, 20,000 tons.

The Victoria and Lawrence companies have not worked their areas since the abrogation of reciprocity, previous to which time they shipped largely to the United States in such small vessels as could navigate the River Hebert to their wharves, to which the coal was transported by tramways. The Milner areas have only been of late prospected; a slope has been sunk at the River Hebert and gravity drainage obtained at the river level. A tramway has been built one third of a mile to the river.

The Lawson was originally completely equipped, extensively worked, and a very superior coal mined previous to the abrogation of reciprocity. The coal was shipped from the company's wharves at Maccan River. Since that date, the mine has been closed. The machinery has never been removed.

### COLORADO.

Mr. John McNeil, State Inspector of Coal Mines, recently made a tour of inspection through the Erie coal mines, in Weld County. Among these mines, are several in the first stages of development, and although the superintendents were working small forces of men, yet they were more than the law permitted, owing to the condition of the mines. The State Inspector immediately ordered a reduction in the number of workmen, in compliance with the law.

### ILLINOIS.

The South Chicago Gas-Light and Coke Company has been incorporated, with a capital of $250,000.

### OHIO.

The proposition to introduce a wire-rope system of underground haulage in the Hocking Valley coal mines is said to meet with favor.

A Coal and Iron Exchange in Youngstown is talked of among those interested through the Mahoning Valley.

### PENNSYLVANIA.

#### ANTHRACITE.

A body of fire-damp was ignited March 1st, by a miner's lamp in an air-passage in Byckle & Co.'s colliery, at Mount Carmel, Pa., and caused an explosion by which three men were seriously hurt.

The collieries throughout the anthracite coal region are just beginning to recover from the effects of the deluge of last week. Many of them are still so flooded that work can not be resumed. At Kehley's Run colliery, Shenandoah, work has been resumed after eight days' idleness. At Keystone colliery, at Ashland, the mules have just been returned, they having been taken out when the flood came. Richardson is still flooded. Potts, at Ashland, is idle. The water is three feet about the railroad in the gangway; but the pumps have remained in control of it, and work will be resumed on Monday. At Girard colliery, however, the water is gaining on the pumps, and no one knows when work will be resumed. At Merriam colliery, February 28th, the water rose so rapidly that the men were compelled to quit work at noon. Lincoln colliery was drowned out February 26th. At Hammond colliery, the column-pipe burst, filling the gangway with water. These eight mines include some of the largest shippers in the region, and their idleness has greatly reduced shipments, while the workingmen lose heavily

The Lehigh & Wilkes-Barre Coal Company held its annual meeting at Philadelphia, February 28th. The report states that the surplus was $99,142. The total production of coal from the mines of the company was 2,245,052 tons, and 93,770 tons were purchased. The sum of $275,273, expended on colliery improvements and for other new work, has been charged to the expense of the business. The mortgage debt was reduced $406,605, exclusive of $34,015 deposited with the trustees for the redemption of the Lehigh Coal and Navigation Company's bonds of 1894. The election for officers resulted as follows: President, W. H. Tillinghast; Directors—H. S. Little, John Keen, George De B. Keim, C. C. Knight, F. A. Comly, and B. Williams.

The Alliance Coal Company has been making some very extensive improvements and changes in its Palmer vein and Kaska William coal operations near New Philadelphia. The former colliery has been idle since last September, and will shortly start up with improvements in machinery, breaker, and other conveniences. There are two slopes in operation, and it is proposed to start shipping at the colliery at 75 cars a day. Kaska William has been doing big work over the winter, averaging 500 tons a day, or 1000 cars a month, and running only half-time.

The commission appointed by the government to revise the mining laws of the State met at Mauch Chunk, February 29th. The commission consists of six coal operators, six mine inspectors, and six miners. Of this number, only two were absent. It was agreed that the present mine laws were very defective and needed revision, and that in some cases the laws were unfair to both miner and operator. The following officers were elected: President, Samuel Hines, of Scranton, operator; Vice-President, James White, Scranton, miner; Assistant-Secretary, Thomas H. Phillip, of Schuylkill, operator. After a few remarks as to the best way of remedying the laws, an adjournment was taken until March 27th, when the commission will meet in Wilkes-Barre.

#### BITUMINOUS.

The Philadelphia & Reading Railroad Company has contracted with manufacturers to take 200,000 tons of the coal-dirt from its mines this year. This refuse will be sold for mixing with bituminous coal at fifty cents a ton.

#### COKE.

Suits have been entered against the Connellsville Iron and Coal Company by five of the widows whose husbands were killed by the recent explosion at the West Leisenring shaft. The damages are laid at $15,000 in each case.

A second meeting of parties interested in forming a coke pool was held at Connellsville, February 29th, and was productive of some solid results. Nearly all the smaller operators were present excepting A. C. Cochran, B. F. Keister, A. C. Overholt, James Cochran, J. D. Moore, and D. J. Rainey; while the syndicate, composed of the H. C. Frick Coke Company, McClure & Co., Colonel J. M. Schoonmaker, and the Connellsville Coke and Iron Company, a quartet of the largest operators and shippers in the region, owning 4746 out of the 9695 ovens in the Connellsville field, was fully represented. The latter submitted a proposition to the smaller operators, the exact terms of which have not been made public. It is understood, however, that commissions are based on a sliding-scale running from 2½ to 15 cents per ton, according to the price of coke. The proposition was accepted by the small operators present, and among those absent Messrs. Overholt, Keister, and A. C. Cochran will sign the agreement. Messrs. J. Cochran, D. J. Rainey, and J. D. Moore, owning 908 ovens, will not go into the pool.

A company has recently been organized in Ligonier township, Westmoreland County, to test the depth of the coal on Four Mile Run.

### TENNESSEE.

The rapidly developing iron and coal-fields of Tennessee, Alabama, and Georgia have attracted the attention the past few years of many capitalists and manufacturers from the Northern States, and large amounts of both Northern and Southern capital have been invested in these properties, says a correspondent of the Pittsburg *Telegraph*. The great abundance of the red and brown hematite ores found in the mountains, yielding from 45 to 60 per cent, easy of access, together with the fine coal-fields developing, from which a good quantity of coke is manufactured, with abundance of lime-rock near at hand, all found on the large tracts the companies have bought at low figures, together with the cheaper labor employed, are evidence enough that they have a great advantage over their Northern competitors. Nearly all the furnaces visited are large, comparatively new, with the most improved machinery, and are now in full blast, each yielding from 80 to 100 tons daily. But little stock is found on the yards, shipments being promptly made. The great problem to be solved in the early opening up of these rich mineral fields a few years ago was the getting their product to points of consumption. This is gradually solving. The building, at an immense outlay of capital, of the Cincinnati Southern Railroad down through the Blue Grass regions of Kentucky, into the coal and iron-fields of Tennessee, 336 miles to Chattanooga, and equipping it in the best manner, both for freight and passenger traffic, give them an opening directly into one of the great iron-distributing points—Cincinnati. This company is doing all in its power to aid persons wishing to locate at any point along its route, and affords them all the shipping possible. Last fall, an important railroad system was formed through this country by the organization of the Cincinnati, New Orleans & Texas Pacific Railroad, with John Scott, President, headquarters at Cincinnati. This route combines the Cincinnati Southern, 336 miles to Chattanooga; the Alabama Great Southern, 295 miles to Meridian, Mississippi; and the New Orleans & Northeastern, 196 miles to New Orleans.

## GENERAL MINING NEWS.

### ARIZONA.

#### COCHISE COUNTY.

GOLDEN RULE.—The affairs of the company are now settling, and it is stated that operations will be resumed.

#### TOMBSTONE DISTRICT.

There is nothing of special interest to report from the mines of this district.

#### PIMA COUNTY.

A Dyer cannon-ball quartz mill is to be erected at Tucson. Mr. J. M. Dyer, the patentee, is now in the city making arrangements.

All mining interest in Southern Arizona is centered in Quijotoa, says the Tucson *Citizen*. So far, no official reports of the amount of work done upon the bonanza mountain has been made public. Three tunnels are driving, and a fourth one begun. The immediate sinking of three shafts on the vein from the summit was also contemplated. Complaints were made that the porphyry through which the tunnels are passing is very hard. Private reports state that in tunnel No. 2, on the west side of the mountain, a four-foot body of good ore has been found. The tunnels on the west side, it is thought, will find the bonanza at a distance of about 50 feet. Another report says that the last tunnel, No. 4, which goes into the Crocker on the east side, has been in ore ever since started. A strange-looking mountain to the south of the Quijotoa peak has apparently the same porphyritic formation as the Quijotoa Mountain itself. The same strange palisades surround this mountain as on the bonanza mountain. As yet, prospectors have failed to find any mineral indications whatever upon it.

#### YAVAPAI COUNTY.

UNITED VERDE.—A strike is said to have been made in the Wade Hampton mine. A body of high-grade copper ore carrying considerable silver was encountered 140 feet from the surface, and it is supposed to belong to a new and intersecting vein. Owing to the bad condition of the roads, the smelter has been shut down for an indefinite period.

### CALIFORNIA.

#### NEVADA COUNTY.

NORTH STAR.—The company is to be organized with a capital of $1,000,000, divided into 100,000 shares. Forty thousand shares are to be sold, the amount realized from the sale of which is to go into the treasury and be expended toward reopening the mine. No stock will be sold for less than one dollar a share, subscriptions to be paid in easy installments as the money is needed. The present owners have also made arrangements for the erection of a mill, payment for which is to be made from the product of the mine.

#### PLUMAS COUNTY—GREENVILLE DISTRICT.

The reaching of the Blake chimney in the Green Mountain mine has created much interest, and great activity in mining during the coming season is expected. Along the range, are many ledges on which locations have been made, but on which the owners have never done more than the necessary assessment-work: all were waiting to see how the Green Mountain would turn out. A great number of these claims will now be worked vigorously.

#### SIERRA COUNTY.

MARGUERITE.—The outlook at present is very satisfactory. The work of opening up the fourth level is progressing favorably, and a fine body of ore is developing. The company has lately expended about $40,000 in making improvements and purchasing machinery. A portion of the machinery is at Truckee, and will be shipped to the mine as soon as the condition of the roads will permit.

### CANADA.

#### PROVINCE OF ONTARIO.

In his report to the Commissioner of Crown Lands, Mr. R. Macpherson, agent at Kingston, reports that the following iron ore has been brought to that city by the Kingston & Pembroke Railroad for shipment by water to the United States during the year 1883:

| | Tons. |
|---|---|
| From Bethlehem Iron Company's mine in Levant | 16,255 |
| Mississippi Mining Company in Palmerston | 2,179 |
| Glendower Mining Company in Bedford | 1,925 |
| Calabogie Mining Company in Blithefield | 712 |
| Total | 21,071 |
| From Ottawa District, by Rideau Canal | 454 |
| Total | 21,525 |

There have also been shipped from that port about 2000 tons of phosphate.

### COLORADO.

#### CHAFFEE COUNTY.

BUENA VISTA MINING AND REDUCTION COMPANY.—This is a new organization that has run the free gold stamp-mill on a lease and recently purchased it. It has also a lease on the Dundena property. This mine shows a vein four feet wide.

COLORADO MINING AND LAND EXCHANGE COMPANY.—This company has recently been incorporated for the purpose of operating concentrators and other machinery for the treatment of silver ores, at Buena Vista.

#### CLEAR CREEK COUNTY.

An important strike is reported in the surface workings on the Ballard & Fulton lease of the Corry City property on Republican Mountain. In the face of the

lower level, 130 feet from the surface, two shots opened up a streak of solid mineral from one to two feet in width.

HUKILL.—Work has begun. The water has been removed and the work of opening up the ore-reserves will shortly commence.

IDAHO TUNNEL.—The tunnel is 1400 feet in length, and is steadily driven ahead. It will intersect one of the richest groups of mines in the county, including the Seaton, Veto, and Tropic. It is expected to cut the Kangaroo, the first of the group, shortly. At 1300 feet from the mouth, the Metropolitan vein was encountered: it shows six inches of mineral.

MENDOTA.—The mine is at present one of the most productive in the county, and is shipping large quantities of rich mineral.

FREMONT COUNTY.

ROYAL GORGE.—The American Mining and Smelting Company has completed arrangements for the use of the Royal Gorge smelter, at Cañon City, for eighteen months to come. This acquisition, together with the large smelting-works of the company located at Leadville will enable the American hereafter to turn out about thirty-five tons of base bullion a day.

GILPIN COUNTY.

FREIBERG.—This gold and silver mining company has been reorganized on a more substantial basis. The men are taking the water out of the main shaft, preparatory to further and deeper developments of the property.

LAKE COUNTY.

The Leadville *Herald* has the following:

ADAMS.—A new shaft will be sunk along the east side line of the Moyamensing claim, and about three hundred feet south of the Moyamensing discovery-shaft, where it is believed a parallel ore-chute will be encountered.

AMERICAN SMELTING COMPANY.—The refining-works, situated in Chicago, purchased by the American Smelting and Mining Company, of Leadville, about ten days ago, have a capacity of desilverizing about sixty tons of base bullion daily. This will place the company in the position of bullion buyers as soon as it assumes control of the refining-works. All the latest improvements suggested by science and practical experience in the desilverizing of bullion have been introduced in these works.

CHRYSOLITE.—The company has temporarily suspended the driving of the incline from the Colorado Chief shaft to the Roberts shaft, the incline making so much water as to make this work impracticable. The lessees in the workings of the Chrysolite mine are doing very little. The mine is shipping considerable ore of good grade.

IRON HILL CONSOLIDATED.—This company has brought suit against the Smuggler combination to secure $150,000, the alleged value of ore illegally extracted by the latter company from the territory of the former.

IRON SILVER.—During January, the mine produced 5500 tons of ore. The mineral, compared with the past productions of the mines, was of fair grade. The output of the company's properties during February will not exceed 5000 tons. The grade, however, is very good.

LITTLE PITTSBURG.—The sinking of No. 10 shaft, on the northern portion of this group, has been discontinued, owing to the bad condition of the ground encountered. The plan is now to sink the No. 6 shaft to a greater depth, and explore the territory to the northward by a level, which is to be started from the 300-foot station.

MORNING STAR.—Scarcely any thing is doing on this property.

RUBY.—The recently-discovered ore-body in the north half of this mine, it is asserted, is developing into a deposit of unusual magnitude. The ore is said to run fifty per cent in lead, twelve ounces in silver, and a quarter of an ounce in gold.

SAMPSON & ESTY.—This concentrating mill in Big Evans Gulch will be started up again as soon as the season opens and the supply of water becomes more abundant and reliable.

SILVER CORD.—The mine is shipping about fifty tons of ore a day, nearly one half as great a production as was made before the mine suspended ore-shipments last fall. The ore goes to the Arkansas Valley and Harrison smelters.

SAN JUAN COUNTY.

SAN JUAN & NEW YORK.—The smelter has closed down for want of ore.

## DAKOTA.

FATHER DE SMET.—The report of the superintendent for the week ended February 22d shows ore extracted from first, second, and third levels, 2000 tons. Ore milled, 1950 tons. Golden Gate south header, third level, advanced 5 feet. Header in 80 feet.

GOLDEN SUMMIT.—The main shaft will be sunk to a depth of at least 200 feet, cross-cutting the lead at intervals; and when this work is completed, and the main tunnel pushed to tap the ore, the mine will be well prospected. When this is accomplished, reduction machinery will be placed upon the property.

## MAINE.

DOUGLAS.—Much work, both in the mine and on the surface, has recently been done. The mill has been repaired and is running, and the leaching operations carried on successfully. A new stope has been opened that will furnish stoping ground for nearly a year to come. Some 75 or 80 tons of fine ore are raised daily. Eleven tons and six hundred and twenty pounds of refined copper were recently shipped.

MASCOT.—This company has just shipped about 30 tons of concentrates to E. Balbach & Sons, Newark, N. J. It is stated that the company receives over 50 dollars net per ton for the concentrates. The mine looks well. The ore is of the same good quality, and about one ton of concentrates are made daily.

## MEXICO.

There is a rumor in mining circles that Mackey and many of his associates of San Francisco have effected the purchase of properties in Northern Mexico.

The mines of Santa Rosa District, State of Hidalgo, under the supervision of Mr. George Schley, are in metal and looking well. There has been some talk of a partial disposition of the stock.

Mr. James Sullivan has returned from New York in the interests of the Pachuca River Concentrating Company and the International Railroad.

The opening of the Mexican Central Railroad to El Paso in April next will lead to the development of vast deposits of coal south of the Rio Grande. Already several companies are formed and preliminaries completed for the opening of veins of rich metal, which, for lack of communication and roads, have remained untouched.

It is believed that many of the American tourists, spending the winter months here, have become interested in Mexico's mineral wealth, and will proceed to the organization of mining companies for the purpose of further development.

## MICHIGAN.

BELT.—There are several thousand tons of rock ready for the mill, and a large amount of ground open in the mine ready for stoping, fully enough to warrant the completion of the second head of stamps as soon as possible. When the other head is ready, additional drills can be set to work, and will easily supply the rock from the mine. The underground workings of the mine are looking well, especially the Butler vein, or the old mine.

NATIONAL.—A report covering the operations for the past year shows that the affairs of this company are in a promising condition. It was the intention, the management states, early in 1883, to erect a Ball stamp, capable of treating from 125 to 150 tons of rock a day; but this purpose was abandoned in consequence of the drop in the prices of ingot copper. The company then decided to shape its work for the year with reference to testing the ground and ascertaining what could be done with the mine as the market stands, and the results are declared to have removed all doubt of its ability to produce copper at a fair profit, even at the ruling prices, when equipped with proper milling facilities. Great credit is accorded by the management to Captain Parnell, who has had charge of the work, for the energy and good judgment displayed in resuscitating the mine from the wrecked condition in which it stood at the beginning of the year. All that is now needed to render it a paying mine is a mill to stamp its ores, the report states, and the showing made by Captain Parnell in his report, embodied in that of the management, fully confirms that opinion.

SAGINAW.—The men are taking out the machinery of the old Saginaw mine, and work of exploring kind has been discontinued at that point.

## MINNESOTA.

COOK COUNTY.—This iron company has filed articles of incorporation at Springfield, Ill. The company has a capital stock of $1,000,000, and intends to work iron mines in Minnesota and elsewhere.

MINNESOTA IRON COMPANY.—The manager states that about April 1st the company would have a couple of hundred men mining iron ore at Vermilion Lake. He said they expected to mine upward of 100,000 tons for shipment this year. Already twenty miles of track have been laid on the Duluth & Iron Range road; several locomotives are in use, and 500 double-pocketed ore cars have been contracted to be built by the Northwestern Manufacturing and Car Company at Stillwater.

## MONTANA.

SILVER BOW COUNTY.

MOULTON.—At the annual meeting of the stockholders, at Salt Lake City, Utah, February 28th, the superintendent presented a report showing the affairs of the company to be in fine condition. The mine looks well and the mill and machinery are in good condition. The following officers were re-elected: W. A. Clark, President; Eli H. Murray, Vice-President; George F. Prescott, Secretary; John M. Moore, Assistant Secretary, New York; James R. Clark, Treasurer. The special business of the meeting of the stockholders, mentioned in the call for the meeting, was considered, and it was the unanimous judgment that, inasmuch as the properties of the company are situated in Montana, the efficient and economical management of the business requires that the corporation should exist in that territory, and a resolution was unanimously adopted, requesting the board of directors to concur, authorizing the president and secretary, upon the organization of a corporation in Montana, of the same name, with a capital stock of $2,000,000, divided into 400,000 shares, to sell and transfer to said corporation all the property of the company, receiving in payment therefor the entire capital stock of the Montana corporation, for the use and benefit of the stockholders. The purport and intent is to dissolve the corporation in Utah and incorporate at Butte City, Montana, where the property is located, and reduce the par value of the stock, from $25 per share to $5. At the meeting of the board of directors, the resolution of the stockholders was adopted by them, and the sale and transfer ordered. The company intends to incorporate in Montana at as early a date as possible and list the stock on the New York Board.

PARROT.—This mine, which is now opening up on the 350-foot level, is producing 110 tons of ore a day, which amount is readily handled at the reduction-works of the company. The capacity of the smelter has lately been considerably increased. The matte shipments for the month of January were larger than for any previous month since the company began operations.

## NEWFOUNDLAND.

A correspondent of the Montreal *Gazette* states that a short time ago a lead and silver mine was opened on the shore of Placentia Bay. It is worked by a London company. So far, the results are very encouraging. The galena contains from 200 to 300 ounces of silver to the ton. Whether the ore will be found in sufficient quantity to be remunerative can only be determined by further operations. A large force of miners is at work. Since this mine was opened, several other deposits of a similar character have been found in the same neighborhood, some of which are reported to be superior to the original find. They are now testing with encouraging results. It is expected that the London company will purchase and work the whole of these claims. These new discoveries go to confirm the opinion that this island is rich in metalliferous deposits, which, as the country is opened up, will be developed.

## SOUTH AMERICA.

BOLIVIA.

The Aullagas Mining Company has recently put in a new shaft, striking a ledge which has been worked at other points with great success, but which at the point now opened is 1¼ meters wide, showing ruby silver and the richest of soft ores.

## UTAH.

BOX ELDER COUNTY.

NORTHERN CHIEF.—A mill with a capacity of 35 tons a day has been erected.

SUMMIT COUNTY.

The great scheme for a tunnel from McHenry Gulch to drain all the mines thereabouts to a good depth, and finally to tap the Ontario about six hundred feet below its present deepest workings, and so make it practically a dry mine for many years to come, has not been fully put in practical form. It will be the greatest enterprise ever undertaken in Utah.

## VERMONT.

The docket for next June term of the Orange County Court shows twenty cases (3 in chancery and 17 at law) pending, in which the Ely copper mines or their owners are concerned. Thus the controversy appears in no way to be ended. There is not as yet any prospect that work on the property will be resumed in the near future. The real facts in the premises are: The property was put in the hands of a receiver after the riot, the old company failing to file the $50,000 bond ordered by the chancellor to be executed to Cazin in protection of his interests. Since then, the receiver has for two months past been smelting the matte and ore on hand, and is now finishing up. The chancellor has officially expressed the intention to order the sale of the property, but so that the parts in which Cazin claims title individually be sold separately. The real order has not even been issued, and may be suspended on motion by parties to the suit.

## VIRGINIA.

IRON BELT LAND, MINING, AND DEVELOPMENT COMPANY.—This company has leased 100,000 tons of iron ore in the Rich Hill mine, Wythe County, and will immediately begin mining on an extensive scale. The option on the lands of Major R. D. and D. T. Martin, in the same county, has been purchased by the Norfolk & Western Railroad for $35,000. These investments, together with the damages paid along the route of the Cripple Creek road, represent a capital of 200,000.
$

## WISCONSIN.

The graphite deposits which are developing by Messrs. Finn Brothers, of Milwaukee, are situated near Humboldt, and exceed in quality any thing of the kind yet found there; but as there has been no real search for this certain mineral, it is altogether probable that other discoveries fully as important will be made.

## FINANCIAL.

### Gold and Silver Stocks.

NEW YORK, Friday Evening, March 7.

There is but little to report in the mining market this week. Business continues to be very dull, and prices rule unsettled, with a weakening tendency. The Bodie stocks were rather quiet, and Bodie was quite weak. The Leadville stocks were also inclined to weakness, Iron-Silver suffering a strong decline. The fancy stocks were quiet with the exception of Sonora, which was largely dealt in at irregular prices. A complete summary of the market is given below. The total number of shares sold aggregates 84,660, as against 79,333 last week.

The Comstock shares were very quiet and steady. California sold at 25c. Consolidated Virginia was quiet, selling from 21@25@24c. Union Consolidated sold from $2.50@$2.15, with a small business. Sutro Tunnel was very quiet, and sold from 15@16c.

The Bodie stocks were but moderately dealt in and were generally steady, with the exception of Bodie Consolidated, which, though selling at high figures, suffered a strong decline from last week; it sold from $10.75@$8.25. Standard was irregular, under a moderate business, selling from $7@$6.50@$6.88. Bulwer was quiet and steady, selling from $1.75@$1.80. Goodshaw sold at 12c. Consolidated Pacific records a small business at strong prices, selling at 35c.

The Leadville stocks were moderately dealt in and prices were a little weak. Amie was quiet and steady at 8@9c. Chrysolite sold at weak prices, with a moderate business; it was quoted at 94@90@92c. Iron Silver was also weak, selling from $1.95@$1.60, with a large business. Leadville sold at 50c. Little Chief was quiet and steady at 50@52c. Little Pittsburg sold at 40c. and Climax at 5c.

The Tuscarora stocks were very quiet at steady prices. Grand Prize sold at 15c. Belle Isle was quiet and steady at 30@25c. Independence sold at 30c.

In the miscellaneous list, Alice was quiet and steady at $2.50. Bassick sold from $9 to $8.25, the latter ex dividend; the transactions were small. Eureka Consolidated was moderately dealt in, and was a little weak; it sold from $3.75@$3.50. Father de Smet records a small business at steady prices, selling from $2.65@$2.60. Gold Stripe sold at 10c. Hall-Anderson rallied and was strong under small transactions; it sold from $1.15@$1.25. Horn-Silver was quiet and steady, selling from $7.13@$7.38. Northern Belle was fairly dealt in, and sold, assessment unpaid, at 3@5@4c. Robinson was very irregular under a small business: it sold from 39@50@30@38c. Sierra Grande was moderately dealt in and was a little weak; it sold from 80@75c. Silver King sold from $6.25@$6, with a small business. Stormont sold from 13@11c. Bonanza King was fairly dealt in at strong prices; it sold from $10@$10.50@$10.25.

Barcelona sold at 10c. Central Arizona was quiet and steady, selling at 30c. Decatur sold at 2c., and was moderately dealt in. Eastern Oregon was quiet and steady, selling from 7@9c. Harlem sold from 7@6c., with a small business. Oriental & Miller was quiet and steady at 14@13c. Rappahannock sold at strong prices, under a moderate business; it was quoted at 14@18@17c. Sonora Consolidated was very actively dealt in at irregular prices; it sold from 8@6@7c. State Line 2 & 3 was a little weak under a small business, selling from 7@5c.

The new management of the Old Dominion Copper Company is going before the stockholders with a proposal to give a mortgage of $1,000,000 on the property of the company as security for the issue of ten year six per cent bonds to fund the debt of $600,000, and to provide for the floating debt and working capital by bonds aggregating $250,000. The stock of the company, $3,000,000, and about $750,000 cash, went to pay for various rights and mines, four or five of the latter being good, and two capable of paying at present freights and low prices of copper; $150,000 went into dead-work, partly useless. If the prospecting-work now going on with the diamond drill in the Globe mine and extension proves the continuity of the ore-bodies, it is believed that the success of the company is assured. The mines are said to be in good ore, and the last yield of the furnaces was 6 tons of 98 per cent black copper per day per furnace. The mine has produced as much as 600,000 pounds per month, but will now for a time produce less, improvements in the plant being in contemplation. We are informed that while running full the mine gave a profit at the rate of about $70,000 per annum.

Erroneous statements have gone forth concerning the Iron Silver mine, the meeting of which was held in this city this week. It has been alleged that "it has passed its dividend," a display of ignorance as to the policy always followed by the management. The company has invariably followed the rule of accumulating profits until the aggregate in treasury reached $200,000. Then the trustees have recommended the paying of a dividend of $100,000, so that at all times not less than $100,000 is in bank as a reserve fund. Whenever the trustees order a new piece of work, the sum is drawn from the excess over $100,000, and the payment of dividends is thus deferred. The managers of the Iron Silver mine deem it wise to reduce the output at the present juncture, and it is likely that they will continue to lessen the product in the near future. They do this in pursuance of a policy forced upon them by circumstances which are quite independent of the capacity of the mine to turn out its full past average tonnage.

The annual meeting of the stockholders of the Iron Silver Mining Company was held in this city on Wednesday last, the 5th inst., and the following gentlemen were elected trustees for the ensuing year: R. H. Rickard, James D. Smith, W. G. Wiley, T. B. Brooks, Homer A. Hoit, W. H. Stevens, L. H. Peirce, John S. Newberry, and William A. Moore. At a subsequent meeting of the trustees, the following officers were elected: John S. Newberry, President; R. H. Rickard, Vice-President; James D. Smith, Treasurer; and Homer A. Hoit, Secretary. By request of the Executive Committee, a committee of three persons from the stockholders was appointed to visit the mine during the year and examine the system of keeping accounts and methods of working the mine, and report the result of its investigation. The committee appointed was: M. Cary Lee, of Philadelphia; E. W. Cottrell, of Detroit; and Homer A. Hoit, of New York.

#### MEETINGS.

The Minnesota Mining Company, No. 239 Broadway, New York City. Annual meeting of stockholders and election of trustees, March 19th, at two o'clock P.M.

#### DIVIDENDS.

The Bodie Consolidated Mining Company, of California, has declared dividend No. 13 of fifty cents per share, payable on the 5th inst. Eastern stockholders of record will be paid at the office of Laidlaw & Co., No. 14 Wall street.

The Bonanza King Consolidated Mining Company, of California, has declared a dividend of twenty-five cents per share, payable March 15th. Eastern stockholders of record will be paid at the office of Laidlaw & Co., No. 14 Wall street. Transfer-books close March 5th.

The Standard Consolidated Mining Company, of California, has declared its usual monthly dividend of twenty-five cents per share, payable March 12th, at the Farmer's Loan and Trust Company.

#### PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report as follows on the market for the week:

Saturday, March 1st, the market opened firm at $1.02¼, and rapidly advanced to $1.05. On Monday, the market touched $1.06¼, from which it quickly declined to $1.04¼, closing at $1.04⅝. Tuesday, the weakness continued, and the market sold down to $1.03¾ at the close. Wednesday, the break was severe, elling down to 99¾c. from an opening at $1.03½. Thursday, the market sold down to 98¼c., and the feeling was very bearish. On Wednesday, Refined was reduced to 8½c., and on Thursday to 8⅜. On Friday, it was advanced to 8½. To-day, the market opened at 98⅞c., sold up to $1.01⅛ and closed at $1.00½ bid, with a prospect of better prices, though the general feeling is bearish.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

| | | Opening. | Highest. | Lowest. | Closing. | Sales. |
|---|---|---|---|---|---|---|
| March | 1.... | $1.02¼ | $1.05 | $1.02¼ | $1.04¾ | 6,889,000 |
| | 3.... | 1.05¼ | 1.06¼ | 1.04¼ | 1.04⅝ | 7.203,000 |
| | 4.... | 1.04½ | 1.04⅝ | 1.03⅜ | 1.03¾ | 5.098,000 |
| | 5.... | 1.03½ | 1.03⅜ | .99¾ | .99⅞ | 6,627.000 |
| | 6.... | .99⅝ | 1.00 | .98¼ | .99 | 7,299,000 |
| | 7... | .98⅞ | 1.01½ | .98⅞ | 1.00½ | 6,545,000 |
| Total sales .... | | | | | | 39,641.000 |

SAN FRANCISCO MINING STOCK QUOTATIONS.

*Daily Range of Prices for the Week.*

| NAME OF COMPANY. | CLOSING QUOTATIONS. Feb. 29. | Mar. 1. | Mar. 3. | Mar. 4. | Mar. 5. | Mar. 6. |
|---|---|---|---|---|---|---|
| Albion | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Alpha | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Alta | 1⅞ | 1⅞ | 1⅞ | 1⅞ | 1¾ | 1¾ |
| Argenta | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Bechtel | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Belcher | 1¼ | 1⅛ | 1⅛ | 1⅛ | 1⅛ | .. . |
| Belle Isle | .25 | .25 | .25 | .30 | .35 | .30 |
| Best & Belcher | 2½ | 2⅝ | 2⅜ | 2⅜ | 2¼ | 2¼ |
| Bodie | 10⅝ | 10⅞ | 10⅝ | 10½ | 10⅛ | 10 |
| Bullion | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Bulwer | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| California | .25 | .25 | .20 | .25 | .30 | .25 |
| Chollar | 2¼ | 2⅛ | 2¼ | 2⅛ | 2 | 2 |
| Con. Pacific | .45 | .45 | .45 | .. .. | .40 | .45 |
| Con. Virginia | .30 | .25 | .25 | .25 | .25 | .25 |
| Crown Point | 1 | 1⅛ | 1⅛ | .. .. | 1 | 1 |
| Day | 2¼ | 2¼ | 2¼ | 2¼ | 2¼ | .. . |
| Elko Cons | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Eureka Cons | 3½ | 3½ | 3½ | .. .. | 3¼ | 3¼ |
| Exchequer | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Gould & Curry | 1¾ | 1¾ | 1¾ | 1⅝ | 1⅝ | 1½ |
| Grand Prize | .15 | .10 | .10 | .05 | .05 | .. . |
| Hale & Norcross | 2¼ | 2⅜ | 2⅓ | 2¼ | 2¼ | 2 |
| Independence | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Martin White | .80 | .. .. | .. .. | .65 | .. .. | .50 |
| Mexican | 2¼ | 2⅜ | 2⅜ | 2¼ | 2 | 2 |
| Mono | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Mount Diablo | 2¼ | 2½ | 2½ | 2½ | .. .. | .. . |
| Navajo | 2¼ | 2⅛ | 2¼ | 2¼ | 2¼ | 2½ |
| Northern Belle | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| North Belle Isle | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Ophir | 1¼ | 1⅜ | 1⅜ | 1¾ | 1¾ | 1⅞ |
| Overman | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Potosi | 1⅛ | 1⅛ | 1⅛ | 1 | 1 | 1 |
| Savage | .75 | .75 | .70 | .75 | .65 | .65 |
| Scorpion | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Sierra Nevada | 3⅜ | 3½ | 3¼ | 3⅛ | 3⅛ | 3 |
| Silver King | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Tip Top | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Union Cons | 2⅞ | 3 | 2¾ | 2⅝ | 2¼ | 2¼ |
| Utah | 2 | 2 | 1⅞ | 1⅞ | 1⅝ | 1⅝ |
| Wales Cons | .. .. | .. .. | .. .. | .. .. | .. .. | .. . |
| Yellow Jacket | 2½ | 2½ | .. .. | .. .. | 2⅜ | 2⅜ |

### Copper and Silver Stocks.

Reported by C. H. Smith, 15 Congress street, Boston, Stock Broker and Member of the Boston Mining and Stock Exchanges.

BOSTON, March 6.

We have to report another week of extreme dullness and inactivity in the market for mining stocks. A writer in one of our local papers says that there is going to be a great boom in copper stocks within a short time; but on what it is predicted, we are at a loss to conceive. There certainly is nothing on the surface to indicate it, however gladly it would be welcomed by the brokers. We fear that the good time coming must be far away. The business at the Stock Exchange for the week would hardly suffice to support more than one broker, provided he had it all; but when divided among one hundred and fifty members, the average allowance would make a poor show. However, as it is said, "the darkest time is just before day," it may be that there is really a movement on foot which will cause rejoicing all along the line. Calumet & Hecla continues to rule steady at $239½@$239¼, with sales of small lots only. Franklin is dull enough; not a single transaction recorded for the week; $11¼ is bid and $11¾ is asked for it. About 50 shares of Quincy changed hands at $45, which seems to be about bottom price for it. Osceola advanced from $16@$17 for a small lot, but sold afterward at $16½, and is firm at $16 bid. Atlantic advanced from $8 (February 12th) to $9 for 30 shares, but is offered for that, with $8 as the best bid. Huron declined from $2@$1⅞ on sales of about 200 shares. Pewabic is neglected—5 shares only sold at $1¼, but that price is bid for it. The report for the year 1883 is not very satisfactory, but the prospect for the coming year is more encouraging. (See report in another column.)

In the silver stocks, there is no new feature at either of the Boards. The amount of business is light, and prices drag heavily. It is very difficult to induce the public to buy at even the present low prices, and all

efforts to start a boom in this class of stocks seem to end in a fizzle. At the Mining Exchange, Bowman Silver is dull at 15@16c., Empire has declined to 20c., notwithstanding the favorable reports which continue to be received from the mine. Dunkin Silver, quiet at 22@24c.; and the rest of the list fails to attract any orders from the outside public.

3 P.M.—At the Board this afternoon, Quincy sold at $45 and Catalpa at 35c. Closing prices: Calumet & Hecla, $239¼ asked. Franklin, $11¼ bid, $11⅝ asked. Huron, $1⅛ asked. Osceola, $16⅛ bid, $16¼ asked. Pewabic, $1¼ bid, $1⅛ asked. Quincy, $44½ bid, $45 asked. Atlantic, $8 bid. Allouez, $1¼ bid, $1⅜ asked.

## BULLION MARKET.

NEW YORK, Friday Evening, March 7.

| DATE. | London. Pence. | N. Y. Cents. | DATE. | London. Pence. | N. Y. Cents. |
|---|---|---|---|---|---|
| March 1 | 51⅛ | * | March 5 | 51 3-16 | 112¼ |
| 3 | 51⅛ | 112⅛ | 6 | 51⅛ | 112¼ |
| 4 | 51⅛ | 112¼ | 7 | 51 1-16 | † |

* 112¼@112⅛. †112¼@112⅛.

The India Exchanges in London have weakened, and in consequence of sales of silver by Austria and Germany, within the last ten days the silver market has weakened and lower figures have been reached, as per our table. The market is also disturbed by other causes, and may be considered more precarious than for some time past.

*Foreign Bank Statements.*—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 3½ per cent. During the week, the bank gained £254,000 bullion, but the proportion of its reserve to its liabilities was reduced from 40⅛ to 38⅞ per cent, against 42½ per cent at this date last year. The weekly statement of the Bank of France shows an increase of 6,050,000 francs gold, and 25,000 francs silver.

*Increase of Coin.*—The following statement has been prepared at the Treasury Department to show the importation and exportation of gold coin and bullion during the years 1882 and 1883. The exports of foreign coin and bullion in 1882 were $6,807,590, and the exports of domestic coin and bullion $49,230,544. Total exports 1882, $56,030,134. The exports of foreign coin and bullion in 1883 were $13,715,650, and of domestic coin and bullion $18,127,790. Total exports of 1883, $31,843,440. The decrease was $24,194,694. The imports of domestic coin in 1882 were $22,500,913, and in 1883, $36,209,318. The increase in 1883 was $13,708,405. It thus appears that from 1882 to 1883 there was a decrease in the exports of $24,194,694, and an increase in imports of $13,708,405, making a total of $37,903,099 more coin and bullion in the United States at the close of the year 1883 than at the close of the year 1882.

*United States Assay-Office at New York.*—Statement of business for the month ended February 29th, 1884:

| | | |
|---|---|---|
| Deposits of gold: | | |
| Foreign coin | $24,000 | |
| Foreign bullion | 47,000 | |
| United States bullion | 349,000 | |
| United States bullion (re-deposits) | 322,000 | |
| Jewelers' bars | 96,000 | |
| Refined gold | 126,000 | $964,000 |
| Deposits of silver: | | |
| Jewelers' bars | 17,200 | |
| Foreign coin | 4,200 | |
| Foreign bullion | 31,900 | |
| United States bullion (contained in gold) | 7,000 | |
| United States bullion (re-deposits) | 3,100 | |
| Arizona | 7,700 | |
| Colorado | 2,200 | |
| Lake Superior | 400 | |
| Montana | 83,000 | |
| Utah | 93,300 | |
| Refined silver | 109,000 | 359,000 |
| Total deposits | | $1,323,000 |
| Gold bars stamped | $1,182,798 | |
| Silver bars stamped | 419,902 | $1,602,700 |
| Transmitted to the Mint of the United States at Philadelphia (silver) | 107,755 | |

*United States Mint.*—The coinage of the Mint in Philadelphia during February amounted to 2,550,000 pieces, valued at $1,179,800. This was made up of 1,100,000 silver dollars, 330,000 dimes, 890,000 five-cent pieces and 230,000 cents.

## METALS.

NEW YORK, Friday Evening, March 7.

**Copper.**—Our market has shown the usual lack of activity, and transactions of Lake have been on a limited scale at the range of 14⅛@15c. From England comes the report that 5000 tons of Lake copper have been placed there at a price equivalent to 13c., a figure which seems unnecessarily low. In other quarters, it is stated that those who bought Lake copper a year ago are trying now to place a balance which they were unable or unwilling to dispose of before this. Other brands than Lake are selling at the range of 13¾@14½c., according to quality.

The latest English cables are £55 for Chili Bars and £63 for Best Selected.

**Tin.**—This metal is quiet, with little business doing in futures, which are firmer than spot. For the latter, we quote, Straits, large lines cash, 17⅞c. bid and 18c. asked. London cables £82 5s.

**Lead.**—This metal has developed additional strength, and there have been sales aggregating about 1000 tons, beginning at 4·10c. and going as high as 4·12½c. Only a little was taken by Western holders. Now it would probably be difficult to place orders at less than 4·15c., which we quote nominally.

There is no doubt that the product of Leadville is falling off heavily, not, we believe, because the mines are not capable of turning out enough ore to keep all the smelters fully occupied. The reduction in the output of the mines is forced in the case of a number of the smaller concerns, but that of the large ones has declined for other reasons. The miners of Leadville have pleaded in vain with the railroad companies; they have found it inexpedient, in view of the character of their mining population, to reduce wages, and some of them have been unable to make satisfactory terms with the smelters. With low lead prices, high freights on ores and supplies, and high wages, their profits are shrinking so that it will not pay to mine low-grade ores, which constitute the bulk of the product. A falling off in the amount of ore handled will prove the most forcible argument for the railroads, an increase in the number of idle men can not help carrying wages to a more reasonable level, while a reduction in the volume of lead thrown upon the markets will give the latter buoyancy and strength. It is not surprising that strong mining companies should prefer to keep reserves intact which would yield little or no profit now, while they might make good returns in the future. They are not mining for the sake of giving railroads tonnage or keeping a body of men employed at high wages. Their policy, if pursued without flinching—and they have the power to do it—means a very heavy reduction in the output of Leadville—possibly from 10,000 to 15,000 tons for the year. It is true that there will be an increase in other quarters, but we doubt whether it will reach any such figure.

Messrs. John Wahl & Co., of St. Louis, wire us as follows to-day:

In sympathy with other markets, an increasing activity has characterized our lead market. Quite a large business has been transacted during the week under review, resulting in sales of about 500 tons of Refined and Hard lead at 3·80c. and 3·85c. Buyers are now freely bidding 3·85c., but holders refuse to take it, the asking price now being 3·90c.

Messrs. Everett & Post, of Chicago, send us the following dispatch to-day:

There is a fairly active demand for both Hard and Soft lead, and prices are held stiff at 3·85@3·87½c. Refiners as a rule prefer to look on and await developments.

**Spelter.**—The better feeling continues, 4¼c. being the lowest figure. London cables £14 10s.

**Antimony.**—This metal continues steady, with Hallett's at 11½c. and Cookson's at 11⅝c.

## IRON MARKET REVIEW.

NEW YORK, Friday Evening, March 7.

The Board of Managers of the Metal Exchange have adopted some important new rules to go into effect March 16th, regulating the deliveries of pig iron. At present, the different grades are called separately, and the principal trading has been in No. 1; but by the new rules, the basis of contracts, unless made for a specific grade, will be No. 2, with the privilege to the seller of delivering either No. 1 or Gray Forge at a difference in value, to be fixed by the pig-iron committee. The change will be of advantage to furnace-men by enabling them to sell all of their output, and as it considerably broadens the field, it is expected to stimulate speculation.

**American Pig.**—There have been no features of special interest, business being confined to small lots. The leading furnace companies have contracts ahead, and are not now anxious to sell. Thus we understand that since the beginning of the year the Thomas Iron Company has booked orders aggregating 89,000 tons. In spite of this, there is anxiety shown by some sellers, and this especially the case with mill irons. We quote No. 1 Foundry at $20.55@$21; No. 2, $19@$19.50; and Gray Forge at $17.50@$18.50. There has been some inquiry for foreign Bessemer pig, which remains quiet at $19.50@$20, and 20 per cent Spiegel is selling at $28.50@$29 ex ship. Ferro-manganese 45 per cent, is worth $45.

At the Metal Stock Exchange, the following transactions were recorded: Monday, March 3d, 100 tons No. 1, April, $19.37½.

**Scotch Pig.**—The market is very quiet and very little business is doing. Importers are firm, however, for reasons independent of the situation here. This week, the arrivals aggregated 2000 tons, a number of overdue steamers arriving in port. Very little of the iron went into store-houses.

We quote ex ship and to arrive: Coltness, $22.50@$23; Langloan, $22.25@$22.50; Summerlee, $21.50; Dalmellington, $20.75; Gartsherrie, $22@22.50; Eglinton, $20.25; and Glengarnock, $22@$22.25.

At the Metal Exchange, the following cable quotations have been received: Coltness, 57s.; Langloan, 54s.; Summerlee, 51s. 9d.; Gartsherrie, 52s. 6d.; Glengarnock, at Ardrossan, 51s. 9d.; Dalmellington, 49s.; and Eglinton, 45s. 9d. Warrants are quoted 42s. 7d.

**Steel Rails.**—There has been no business worthy of special mention. We quote $34@$35 at mill, according to quantity, section, etc.

**Old Material.**—We quote, nominally, $21.50@$22 for Ts.

### Philadelphia. March 6.

[From our Special Correspondent.]

*Pig-Iron.*—The strength which was expected in the iron trade has not been developed. Rumors have been afloat during the past two or three days, as to transactions at lower rates than have yet been quoted. There is good reason for this state of things, as buyers decline to buy excepting in a small way, saying that the demand for their products does not justify them in following any other than the hand-to-mouth policy that has been so common since the opening of the year. Now and then, a few days of activity come along; but, as a rule, demand is weak and only urgent requirements are filled. There have been no changes in quotations recently. Prices show some weakness, except for the Standard and special brands, which are held firmly at $21@$21.50 for No. 1 Foundry. No. 2 sells occasionally at $19.50, but more at $19. A good deal of Gray Forge iron has sold at $18, and a little at $18.50. These exceptional cases are likely to become general, as consumers are willing to pay current rates for small lots rather than stock up at the concessions, which could be had for large lots, were they to make inquiries and offers. Bessemer iron is quoted at $20@$20.50, but none will sell over $20, and very little at that. Scotch iron is moving in small lots for current requirements at about former quotations. Southern irons are inquired for, but the supply is sold up for some time to come.

*Muck-Bars.*—Very little business deserving of mention has been done. Quotations are $31.75 to $32.50, with most sales in small lots at $32.

*Blooms.*—A good deal of business was done, both for present and prospective requirements, at the usual figures. Efforts were made to buy at from 50 cents to $1 below present figures, but makers hold firmly to their asking prices.

*Merchant Iron.*—In refined iron, there is nothing unusual to report. The market is called dull, and, so far as orders are concerned, practically is dull, although the same capacity is at work which has been at work all along, and will probably so continue for some time. There is no particular movement. Prices

# NEW YORK MINING STOCKS.

## DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | March 1. | | March 3. | | March 4. | | March 5. | | March 6. | | March 7. | | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Alice, Mon. | 2.50 | | | | | | | | | | | | 100 |
| Amie Con., Co. | .08 | | | | | | .09 | | .09 | | | | 2,400 |
| Argenta, Ne. | | | | | | | | | | | | | |
| Bar. & Walker, Ut. | | | | | | | | | | | | | |
| Bassick, Co. | | | | | 9.00 | | 8.75 | 8.25 | 8.25 | | | | 200 |
| Belle Isle, Ne. | .30 | | .25 | | | | | | | | | | 300 |
| Bodie Cons., Ca. | | | 10.75 | 10 25 | | | 9 50 | | | | 8.25 | | 265 |
| Bonanza King | 10.00 | | 10.50 | 10.00 | 10.38 | 10.00 | 10.00 | | 10.38 | | 10.25 | 10.13 | 3,265 |
| Breece, Co. | | | | | | | | | | | | | |
| Bulwer, Ca. | | | 1 75 | | | | | | 1.80 | | | | 200 |
| California, Ne. | | | .25 | | | | | | | | | | 1,000 |
| Cal. & Hecla, Mich. | | | | | | | | | | | | | |
| Carbonate Hill | | | | | | | | | | | | | |
| Caribou Con., Co. | | | | | | | | | | | | | |
| Castle Creek | .23 | | | | | | | | | | | | 100 |
| Chrysolite, Co. | .03 | | | | .93 | | | | .94 | .90 | .92 | | 2,000 |
| Cons. Va. Ne. | | | | | | | .24 | .21 | .25 | | .24 | | 2,000 |
| Crown Point | | | | | | | | | | | | | |
| Dunkin, Co. | | | | | | | | | | | | | |
| Eureka Cons., Ne. | | | 3.75 | 3.65 | 3.70 | | | | 3.50 | | | | 700 |
| Excelsior, Ca. | | | | | | | | | | | | | |
| Father de Smet, Dk. | 2.05 | | | | 2.60 | | | | | | | | 200 |
| Findley, Ga. | | | | | | | | | | | | | |
| Gold Stripe, Ca. | | | | | .10 | | 10 | | | | | | 600 |
| Gould & Curry, Ne. | | | | | | | | | | | | | |
| Grand Prize, Ne. | .15 | | | | | | | | | | | | 400 |
| Great Eastern, Dk. | | | | | | | | | | | | | |
| Green Mountain, Ca. | | | | | | | | | | | | | |
| Hale & Norcross, Ne. | | | | | | | | | | | | | |
| Hall-Anderson, N. S. | | | | | | | | | | | | | |
| Hibernia, Co. | | | | | | | 1.20 | 1.15 | 1.20 | 1.15 | 1.25 | 1.20 | 3,600 |
| Homestake, Dk. | | | | | | | 9.50 | | | | | | 25 |
| Horn-Silver, Ut. | 7.25 | 7.13 | | | 7.38 | | 7.38 | | 7.25 | | 7.38 | | 1,830 |
| Hukill, Co. | | | | | | | | | | | | | |
| Independence, Ne. | | | | | .30 | | | | | | | | 100 |
| Iron Silver, Co. | 1.95 | | | | 1 95 | | 1.90 | 1 70 | 1.70 | 1.60 | 1.70 | 1.60 | 11,150 |
| La Plata, Co. | | | | | | | | | | | | | |
| Leadville C., Co. | .50 | | | | | | | | | | | | 500 |
| Little Chief, Co. | | | .50 | | | | | | .52 | | | | 13) |
| Little Pittsburg, Co. | | | | | | | | | .40 | | | | 100 |
| Martin White, Ne. | | | .85 | | | | | | | | | | 100 |
| Moose, Co. | | | | | | | | | | | | | |
| Navajo, Ne. | | | | | | | | | | | | | |
| Northern Belle, Ne. | .04 | .03 | .05 | | | | .05 | .04 | | | | | 7,150 |
| North Belle Isle, Ne. | | | | | | | | | | | | | |
| Ontario, Ut. | | | | | | | 28.00 | | | | | | 10 |
| Ophir, Ne. | | | | | | | | | | | | | |
| Plumas, Ca. | | | | | | | | | | | | | |
| Prussian, Colo. | | | | | | | | | | | | | |
| Quicksilver Pref., Ca. | | | | | | | | | | | | | |
| " Com., Ca. | | | | | | | | | | | | | |
| Rising Sun, Ca. | | | | | | | | | | | | | |
| Robinson Cons., Co. | .50 | .39 | .37 | .32 | .40 | .30 | .38 | | | | | | 3,300 |
| Saint Joseph's Lead. | | | | | | | | | | | | | |
| Sava,e, Ne. | | | | | | | | | | | | | |
| Sierra Grande, N. M. | | | .80 | | .80 | | 80 | | .80 | .75 | | | 2,100 |
| Sierra Nevada, Ne. | | | | | | | | | | | | | |
| Silver King, Ar. | 6.25 | 6.13 | 6.00 | | | | | | | | | | 300 |
| Spring Valley, Ca. | | | | | | | | | | | | | |
| Standard, Ca. | 7.00 | 6.75 | 7.00 | | 6 50 | | 6.75 | | 6.88 | | | | 705 |
| Stormont, Ut. | | | | | | | .13 | .11 | | | | | 2,500 |
| Tip Top, Ar. | | | | | | | | | | | | | |
| Tombstone, Ar. | | | | | | | | | | | | | |
| Vizina, Ar. | | | | | | | | | | | | | |
| Yellow Jacket | | | | | | | | | | | | | |

## NON-DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | March 1. | | March 3. | | March 4. | | March 5. | | March 6. | | March 7. | | SALES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Alta-Montana | | | | | | | | | | | | | |
| American Flag | | | | | | | | | | | | | |
| Barcelona, G. | | | | | | | | | | | .16 | | 300 |
| Bear Creek | | | | | | | | | | | | | |
| Bechtel Con., G. | | | | | | | | | | | | | |
| Belvidere | | | | | .65 | | | | | | | | 250 |
| Best & B'icher, G. S. | | | | | | | | | | | | | |
| Big Pittsburg, S. L. | | | | | | | | | | | | | |
| Bradshaw, S. | | | | | | | | | | | | | |
| Buckeye | | | | | | | | | | | | | |
| " pref. | | | | | | | | | | | | | |
| Bull-Domingo, S.L. | | | | | | | | | | | | | |
| Bye and Bye | | | | | | | | | | | | | |
| Calaveras, G | | | | | | | | | | | | | |
| C'lav'r's W. & M. Co. | | | | | | | | | | | | | |
| Cal., G. | | | | | | | | | | | | | |
| Central Aris'na, S. | | | .30 | | .30 | | | | | | | | 200 |
| Cherokee, G. | | | | | | | | | | | | | |
| Climax, Co. | .05 | | | | | | | | | | .05 | | 1,000 |
| Colorado Central. | | | | | | | .30 | | | | | | 100 |
| Cons. Pacific | | | .35 | | .35 | | .35 | | .35 | | | | 1,100 |
| Crowell, G. | | | | | | | | | | | | | |
| Dahlonega, G. | | | | | | | | | | | | | |
| Decatur | .02 | | .02 | | .02 | | .02 | | | | | | 9,200 |
| Dunderberg | | | | | | | | | | | | | |
| Durango, G. | | | | | | | | | | | | | |
| Eastern Oregon | .07 | | | | .08 | | .09 | .07 | | | | | 2,200 |
| Elko Cons. | | | | | | | | | | | | | |
| Enterprise | | | | | | | | | | | | | |
| Fannie Barret | | | | | | | | | | | | | |
| Globe Copper | | | | | | | | | | | | | |
| Gold Placer, G | | | | | | | | | | | | | |
| Goodshaw, G. | | | | | | | 12 | | | | | | 200 |
| Granville, G. | | | | | | | | | | | | | |
| Harlem M. & M. Co. | | | .07 | .06 | .06 | | | | | | | | 2,100 |
| Hortense, S. | | | | | | | | | | | | | |
| Imperial | | | | | | | | | | | | | |
| Lacrosse, G. | .10 | | | | | | | | | | | | 500 |
| Lucerne | | | | | | | | | | | | | |
| Mariposa Pref., G. | | | | | | | | | | | | | |
| " Com., G. | | | | | | | | | | | | | |
| Mexican, G. S. | | | | | | | | | | | | | |
| Miner Boy | | | | | | | | | | | | | |
| Mono | | | | | | | | | | | | | |
| North Mexican | | | | | | | | | | | | | |
| North Standard, G. | | | | | | | | | | | | | |
| N. Horn-Silv'r, S.L. | | | | | | | | | | | | | |
| Ori'nt'l & Miller, S. | .14 | | | | | | | | | | .13 | | 700 |
| Parnell | | | | | | | | | | | | | |
| Rappahannock, G. | .14 | | .18 | .15 | .17 | .16 | .17 | | | | | | 3,700 |
| Red Elephant, S. | | | | | | | | | | | | | |
| Ruby, of Arizona | | | | | | | | | | | | | |
| Silver Cliff, S. | | | | | | | | | | | | | |
| Sonora Con. | .08 | | .07 | .06 | .06 | | .07 | .06 | .07 | | | | 11,400 |
| South Bodie, G. | | | | | | | | | | | | | |
| South Bulwer, G. | | | | | | | | | | | | | |
| South Hite | | | | | | | | | | | | | |
| South Pacific | | | | | | | | | | | | | |
| State Line, 1 & 4, S. | | | | | | | | | | | | | |
| " Nos. 2 & 3, S. | .07 | | .06 | | .06 | | .05 | | .05 | | | | 1,500 |
| Sutro Tunnel | .16 | | | | | | | | | | .16 | .15 | 2,500 |
| Tioga | | | | | | | | | | | | | |
| Taylor Plumas | | | | | | | | | | | | | |
| Unadilla, S | | | | | | | | | | | | | |
| Union Cons., G. S. | | | | | | | 2.50 | | | | 2.15 | | 70 |

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 47,690. Non-dividend shares sold, 36,970.

## BOSTON MINING STOCKS.

| | Feb. 29. | | March 1. | | March 2. | | March 4. | | March 5. | | March 6. | | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Allouez | | | | | | | | | | | | | |
| Amie | | | | | | | | | 9.00 | | | | 30 |
| Atlantic | | | | | | | | | | | | | |
| Aztec | | | | | | | | | | | | | |
| Bodie Con. | | | | | | | | | | | | | |
| Bonanza D. | | | | | | | | | | | | | |
| Bowman Sil | | | | | | | | | | | | | |
| Bruns. Ant. | | | | | | | | | | | | | |
| Bulwer | | | | | | | | | | | | | |
| California | | | | | | | | | | | | | |
| Cal. & Hec. | 239½ | | | | 239½ | | 239¼ | 239 | 239½ | | 239¼ | | 32 |
| Catalpa | | | | | | | | | | | .35 | | 200 |
| Climax | | | | | | | | | | | | | |
| Co. Virginia | | | | | | | | | | | | | |
| Contentm't. | | | | | | | | | | | | | |
| Copper F'lls | | | | | | | | | | | | | |
| Crescent | | | | | | | | | | | | | |
| "Cusi" | | | | | | | | | | | | | |
| Decatur | | | | | | | | | | | | | |
| Deer Isle | | | | | | | | | | | | | |
| Denver City | | | | | | | | | | | | | |
| Douglas | | | | | | | | | | | | | |
| Duncan | | | | | | | | | | | | | |
| Dunkin | | | | | | | | | | | | | |
| Elko Con | | | | | | | | | | | | | |
| Empire | | | | | | | | | | | | | |
| Eureka Con. | | | | | | | | | | | | | |
| Franklin | | | | | | | | | | | | | |
| Gila County | | | | | | | | | | | | | |
| Hancock G. | | | | | | | | | | | | | |
| Harshaw | | | | | .50 | | | | | | | | 100 |
| Horn Silver | | | | | | | | | | | | | |
| Huron | 1.88 | | | | | | 1.88 | | 1.88 | | | | 225 |
| Independ'ce | | | | | | | | | | | | | |
| Indian Qeen | | | | | | | | | | | | | |
| Mammoth | | | | | | | | | | | | | |
| Mass. & N.M. | | | | | | | | | | | | | |
| Napa | .45 | | | | | | | | .45 | | | | 300 |
| National | | | | | | | | | | | | | |
| North Belle | | | | | | | | | | | | | |
| Ontario | | | | | | | | | | | | | |
| Osceola | | | 17.00 | | | | 16.50 | | 16.50 | | | | 70 |
| Penn-Breck | | | | | | | | | | | | | |
| Pewable | 1.25 | | | | | | | | | | | | 5 |
| Plymouth | | | | | | | | | | | | | |
| Pontiac | | | | | | | | | | | | | |
| Quincy | 45.00 | | | | | | 45.00 | | 45.00 | | 45.00 | | 62 |
| Ridge | | | | | | | | | | | | | |
| Robinson | | | | | | | | | | | | | |
| San Pedro | | | | | | | | | | | | | |
| S'ra Grande | | | | | | | | | | | | | |
| Silver Islet | | | | | | | | | | | | | |
| Silver King | | | | | | | | | | | | | |
| Simpson Gd | | | | | | | | | | | | | |
| Sonora Con | | | | | | | | | | | | | |
| South Pacl. | | | | | | | | | | | | | |
| Standard | | | | | | | | | | | | | |
| Sullivan | | | | | | | | | | | | | |
| Sutro Tun. | | | | | | | | | | | | | |
| Sycamore | | | | | | | | | | | | | |
| Twin Lead. | | | | | | | | | | | | | |
| Vizina | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

## PHILADELPHIA MINING STOCKS.

| | Feb. 29. | | March 1. | | March 3. | | March 4. | | March 5. | | March 6 | | Sales. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Amer. Cons. | | | | | | | | | | | | | |
| Argent | .19 | | .20 | .18 | .20 | .19 | | | .19 | | .18 | | 7,700 |
| Arizona So. | | | | | | | | | | | | | |
| Battle Mt. | | | | | | | | | | | | | |
| Buena | | | | | | | | | | | | | |
| California | | | | | | | | | | | | | |
| Calista | | | | | | | | | | | | | |
| Chrysolite | | | | | | | | | | | | | |
| Cincinnati | | | | | | | | | | | | | |
| Comprom'e. | .37 | | | | | | | | | | .35 | | 1,100 |
| Contention | | | | | | | | | | | | | |
| Con. Virg. | | | | | | | | | | | | | |
| Dauntless | | | | | | | | | | | .02 | | 4,600 |
| Del Monte | | | | | | | | | | | | | |
| Denver City | .17 | | | | | | | | | | | | 1,000 |
| Eureka | | | | | | | | | | | | | |
| Girard | | | | | | | | | | | | | |
| Governor | | | | | | | | | | | | | |
| Grand Uni'n | .07 | .06 | | | .06 | | | | | | .05 | | 6,000 |
| Green Mt. | | | | | | | | | | | | | |
| Gunnison | | | | | | | | | | | | | |
| Homestake | | | | | | | | | | | | | |
| Horn Silver | | | | | | | | | | | | | |
| Iowa Gulch | .01 | | .02 | | | | | | | | .01 | | 11,000 |
| Iron Silver | | | | | | | | | | | | | |
| King Bul'on | | | | | | | | | | | | | |
| Ledger Con. | | | | | | | | | | | | | |
| Little Chief | | | | | | | | | | | | | |
| Little Dia'd. | | | | | | | | | | | | | |
| Little Mat'd | | | | | | | | | | | | | |
| L'g & D'y H | | | | | | | | | | | | | |
| Montana | | | | | | | | | | | | | |
| Mt. Sheridan | | | | | | | | | | | | | |
| Navajo | | | | | | | | | | | | | |
| North'n B'l. | | | | | | | | | | | | | |
| Orion | | | | | | | | | | | | | |
| Orion Pref. | | | | | | | | | | | | | |
| Palmetto E. | | | | | | | | | | | | | |
| Pembina | | | | | | | | | | | | | |
| Penn-Breck | | | | | | | | | | | | | |
| Permanent | | | | | .04 | | .04 | | .04 | | .04 | .03 | 5,100 |
| Pizarro | | | | | | | | | | | | | |
| Pizarro Ex. | | | | | | | | | | | | | |
| Potosi | | | | | | | | | | | | | |
| Rara Avis | | | | | .07 | .06 | .07 | | .07 | | | | 1,000 |
| Rara Avis E. | | | .05 | | .06 | | .06 | .05 | .05 | | .05 | | 11,300 |
| Record | | | | | | | | | | | | | |
| Rico Pion'r | | | | | | | | | | | | | |
| Sierra Apac. | .33 | .27 | .30 | | .32 | | .32 | | .26 | | .30 | | 4,420 |
| Sierra Be.la. | .85 | | .90 | | .90 | .87½ | .85 | .85 | .85 | .80 | .90 | .82½ | 11,070 |
| Sierra G'nde | .75 | .72½ | | | .77½ | | .77½ | .75 | .75 | .70 | .75 | .70 | 5,965 |
| Sierra Nev. | | | | | | | | | | | | | |
| Silver Cord | | | | | | | | | .95 | | | | 100 |
| Silver King | | | | | | | | | | | | | |
| Silv'r Plume | | | | | | | | | | | | | |
| Sonora Con. | | | | | | | | | | | | | |
| Standard | | | | | | | | | | | | | |
| Sultana | | | | | | | | | | | | | |
| Sutro Tun'l | | | | | | | | | | | | | |
| Tombstone | | | | | | | | | | | | | |
| Victor | | | | | | | | | | | | | |
| Yale Mt. | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

are generally about 2c., although some buyers are offering 1·80@1·90c.

*Structural Iron.*—Sales of some 5000 tons of bridge iron will probably be closed within a day or two, but at present writing nothing is decided. Municipal requirements are presented, and orders have been placed this week, footing up perhaps from 500 to 600 tons.

*Plate and Tank Iron.*—Quotations are unchanged, and the inquiries in hand indicate that the anticipations heretofore indulged in will be realized before the 1st of April. Several hundred tons are now in negotiation, and will probably be closed for on Saturday, or Monday, for requirements in or near the city.

*Steel.*—The supply is increasing, and makers are anticipating an active spring trade, although they do not hope for any improvement in prices.

*Sheet-Iron.*—There is an increased inquiry, and manufacturers are looking for a sharp improvement in a few days.

*Steel Rails.*—The market is utterly devoid of features of interest. Parties who could place large orders for summer requirements are indifferent, and as their orders could not be filled at a very early date, they will take the advantage of postponing business to the latest hour, in order to tire makers of holding to their present figures.

*Crop-Ends.*—Average quotations, $19@$19.50; best offers heard of this week, $18.50. Large sales could be made at this latter figure, and it is likely, according to the statements of some brokers, that transactions will be closed within two or three days.

*Old Rails.*—Western buyers are short of stocks, and have been making urgent inquiries for supplies, but decline to pay over $23.50, which is 50 cents below the delivery price in Western Pennsylvania. Nominal quotations here, $22.75@$23.25 for foreign. Double-Heads, nominally $23.75.

*Scrap-Iron.*—$24 is quoted for best No. 1 wrought.

### Pittsburg. March 5.

[From our Special Correspondent.]

The iron trade in this section seems to have taken a start in the right direction, and prices are firmer all around than they have been for some months past. Business for the past week has been of moderate proportions, and no advance in quotations can be reported; but a greatly improved feeling prevails, and manufacturers are very hopeful of better times in the near future. Production is cautiously increased. Some mills have a very fair supply of orders, and all are at work. Bars are quoted at 1·80@1·90c., and demand is more freely presented and inquiry is more active. Pig-iron has sold in from 100 to 500-ton lots of Forge at $17@$18. Small lots of White and Mottled iron sold at $16@$16.50; Foundry, $18@$21, according to number and quality. The production of nails is increasing, and demand is of larger proportions. Muck-Bars are selling slowly at about $32. Wrought-iron pipe is still in dull demand; quotations unchanged. Crop-Ends are quoted at $21.50@$22 for American. Railroad track supplies are dull. A little more business in Scrap is reported at $20@$21 for wrought.

The green glass bottle factory of Ihmson & Co. will soon resume work at last year's wages. It is probable that other manufacturers will yield, now that the break has been made, and the strikers, who have been out since last June against a 20-per cent reduction, are very likely to win. All the window-glass factories have resumed work, and have abundant orders for all the glass they can make for months to come.

## COAL TRADE REVIEW.

New York, Friday Evening, March 7.

### Anthracite.

The market during the week has been quiet, though the cold weather prevailing during part of it has had the effect of preventing accumulation of coal to any serious degree. The tone among a number of prominent men in the coal trade seems to be, that it will be good policy to make the opening prices low. With the present outlook, it would be folly, in the face of the competition of bituminous coal, to attempt any thing like seeming to hold out for high figures. There are indications that some of the large anthracite companies have faced the situation, and have placed large blocks of steam sizes in the East at figures low enough to prevent their customers from abandoning them.

### Bituminous.

The fight evidently continues, though an effort is making to create the impression that better prices are made for contracts. It is stated that the New York Central has closed a contract for fully 100,000 tons with a Cumberland and an Elk Garden firm. A number of guesses are made as to the price, the figures varying between $3.40@$3.65. New York current business is small, and it is contested in a manner never witnessed before.

### Philadelphia. March 6.

[From our Special Correspondent.]

The fact of the Pennsylvania Railroad Company having reduced freights from net to gross, at Greenwich, is not of any practical benefit to the Pennsylvania shippers of bituminous coal, who are obliged to compete with Cumberland coal, offered and sold alongside, at Philadelphia, for $3. The anthracite people say that the bituminous operators are taking the trade, while the bituminous operators say they are doing nothing. Some soft coal miners have secured a few large contracts, one being closed to-day for 8000 tons. Several have been given out, and a few more will be closed by Saturday, but the circumstances are exceptional. It is asserted that the Cumberland operators are carrying away the best of the trade, notwithstanding the fact that the rates for the season have, as yet, not been publicly announced. The charge of favoritism is repeated, and is the occasion of a good deal of complaint among those who suffer by their inability to compete with Cumberland coal. Rates and tolls will be announced on the 20th, and as soon as these are known, a large amount of business will be done, which is now held back until these matters can be determined. A good many inquiries are in hand for anthracite coal, and the probabilities are favorable to a very heavy demand as soon as these uncertainties are removed. The mines have been put in good shape; considerable new and improved machinery has been put in; and the facilities for mining and shipping coal are considerably increased. There have been no recent meetings of coal men, and none is talked of, excepting the meetings of the companies, to determine spring tolls. There are 115,000 tons at Port Richmond, this afternoon. A large fleet of vessels is awaiting employment. Schooner rates are $1.25@$1.40. Some shippers expect to secure more favorable rates. Our advices to-day from the Chicago and Milwaukee markets are encouraging, and by next week a number of large contracts will probably be entered into. Advices this week from the South Atlantic ports are favorable to an improving business. The cold weather last week gave a spurt of improving demand to the domestic and line trade. The manufacturing requirements throughout Eastern Pennsylvania are not presented, and manufacturers continue to run with light stocks. The coal companies will not be obliged to reduce quotations, according to current talk of those representing producing interests; but the other side claim that the spring prices will show a considerable drop. Rather than have prices weaken, restriction will be extended.

Very little is said to have been done this week in the bituminous trade. Some two or three companies seem to be monopolizing the business done, while the greater number seem to be doing nothing. The whole thing hinges on freight rates to be named. The Pennsylvania coal operators feel that they have not been fairly dealt with so far, but their interest will very likely be taken care of. To what extent bituminous coal will supplant anthracite for steam purposes is not easy to guess. The outside markets will make up for any invasion of this character, and the result will not militate against anthracite coal interests. There is no further talk of any decline in wages. Some of the Mountain mine owners are endeavoring to place contracts, but find it difficult to place large blocks. The line trade is taking small quantities, and no inducements that the bituminous operators are able to offer serve to increase the demand.

### Pittsburg. March 6.

[From our Special Correspondent.]

Trade here seems to be slowly improving in some features, though, taken as a whole, it is duller and more unsatisfactory than for years.

In the railroad trade, I find fewer growlers than was the case a week ago. Demand is fully up to the average from the mills and industries of this city, and the price of coal on the wall is fairly quotable at 6 cents per bushel. Gas-coal to distant points is inquired for, but consumers insist on lower prices. This is accounted for by the rapid growth of new railroads that, with their Western connections, bring to the front new gas-coal fields in different portions of this and other States. Pan-Handle operators are still unsettled as to the future of their trade, due to the causes I have already enumerated. The labor situation on this road is in a very complicated shape, and it is evident that the miners are divided on the question of the summer rates for mining. The question of electing the right man to represent this important mining district in the coming meeting of the Trades' Tribunal has developed a deal of dissatisfaction in the ranks of the Miners' Union, and operators have good grounds for hoping that the diggers will accept lower rates after April 1st. The future is decidedly mixed as to the labor question, not only in the railroad but in the river trade.

River pits are busy, except in the third pool, where the strike still continues, but the outlook of the trade is decidedly discouraging. At Cincinnati, the Kanawha is capturing strongholds heretofore occupied by the Pittsburg fuel. The water-works is one of the jobs referred to. The Kanawha coal has every advantage—cheaper mining by nearly 1 cent per bushel; nearer to market, enabling tow-boats to make two trips while those of this city make one; and more uniformity in favorable stages of water. The Winifrede Company, of Philadelphia, is pushing things in the Kanawha region, and the Pittsburg coal men look on in ill-concealed alarm. The result will be—or I am very much mistaken—a determined stand to reduce miners' wages to at least 3 cents, just so soon as the present run of coal is taken out. Local river trade is more active, and prices are the same, possibly a shade lower than railroad figures.

As to coke, there seems better times ahead. For March, prices will remain the same as they have been for months, $1@$1.25 per ton. But after April 1st it is said the new agreement will go into effect. This is an arrangement by which the "syndicate," or heavy operators, will sell all the coke made by the smaller operators for a commission ranging from 2½ to 15 cents per ton, according to the market rates. The small operators in return bind themselves to build no new ovens, and to reduce production, at the request of the syndicate. The plan seems to give satisfaction to all concerned.

### Buffalo. March 6.

[From our Special Correspondent.]

Since my last letter, the weather has been severely cold, and the demands on coal-bins and yards, as a consequence, large. Last Friday's weather report gave these figures: Minimum temperature during night, 7·4 degrees below zero; at seven A.M., 6 degrees below; and at nine A.M., one degree below. Cutting winds and moist atmosphere were generally prevalent for several days. Yesterday, the temperature was higher, with indications that the cold snap had passed away.

Many of our prominent coal dealers are away, and from those interviewed came the sterotyped "nothing to report." February prices for anthracite are continued through March, as follows, per gross ton: Grate, $5.05; egg, $5.25; stove, $5.55; chestnut, $5.70; No. 4, $5.80; and pea, $3.65.

The Committee of Fifteen will meet at the Gilsey House, New York City, on the 12th of March, when the Executive Committee will report such plans and suggestions as they may deem best for the management of the Western coal trade for the coming season. It is understood that no agreements or contracts as to prices for the sale of coal are to be entered into pending the report of the Executive Committee.

On Thursday, March 13th, the producers and shippers interested in Western trade will hold a general meeting. The several presidents of the coal and railroad companies interested in the transportation of

coal to the West are invited to be present and assist in the deliberations, "if, in the judgment of the Executive Committee, the attendance and co-operation of these gentlemen can be obtained."

The New York Central Railroad Company has earnestly taken up the question of protecting itself and shippers from the pilferers of coal at its stations at Lyons and Rochester, and has secured the conviction of a large number of persons on whose premises the stolen coal was found, and obliged others to pay for that found in their possession, which they were only too glad to do to save prosecution. It is to be hoped that this is the beginning of a movement to protect shippers all along the lines of railroads, especially at terminal points like Buffalo.

Coal freights by lake hence Westward have not been fixed yet. Shippers and vessel owners are apart in their views; the former offer $1 per ton to Duluth; the latter ask $1.25. One dollar is asked to Chicago, and 80c. bid. The movement is expected to be very large this year. Some anticipate a one third increase over last season's shipments, and others say one half.

The receipts here by the Lake Shore & Michigan Southern Railroad for the week ended Saturday last were 864 tons; 468 tons for Buffalo, and 396 tons for other points. For the month of February, 2569 tons; 1347 tons for Buffalo, and 1222 tons for other points. From January 1st to February 29th, inclusive, 8137 tons; 4681 tons for Buffalo, and 3456 tons for other points.

On the final passage of the bill introduced in the Assembly at Albany relative to altering one of the locks on the Erie Canal so as to pass two boats or a steamer and consort, instead of one as at present, the amendment was made that the experiment should be tried at Lock No. 50, four miles west of Syracuse, instead of No. 46, at Utica, as it was thought a fairer test could be made at the former place. The cost of the enlargement will be $30,000. It is expected that considerable opposition will be found in the Senate, for political reasons! As I mentioned some time since, the plan, if adopted on all the locks, would really double the capacity of the canal and cheapen transportation.

Some days ago, the referee made a report in favor of appointing commissioners to appraise the valuable property facing the river on Central wharf, now occupied and owned by the Union Steamboat Company. This property is wanted by the Delaware, Lackawanna & Western Railroad Company. Last Saturday, fifty-four exceptions to the report were filed by the attorney of the Union Steamboat Company, which is determined to resist what it deems a high-handed outrage on its rights as a company in connection with the New York, Lake Erie & Western Railroad.

A local newspaper published the following paragraph on Monday: "Anthracite coal people say they expect to lose sale of about 3,000,000 tons this year, owing to competition of soft coal and lessened demand for iron manufactures. The loss is expected to be recouped by increased demand for domestic trade."

News from the Straits of Mackinaw reports severe weather, and prognosticators say that navigation will not open before the 15th of April, if then.

**Boston.** March 6.

[From our Special Correspondent.]

The anthracite branch of the coal trade continues dull, and with no special signs of improvement. There will be no movement until the appearance of the new circulars, and there seems to be no hurry about putting them out, so that there is the natural inference of lower prices when a change is announced. If the weather continues cold, the new circular will not probably be out until the 20th inst. Meantime, the f. o. b. figures are nominally unchanged at $4.40 at New York and $4.15 at Philadelphia. On some grades of coal, lower figures might be had. Lykens Valley coal and all such free-burning coals continue firmer than the rest of the list.

The consumption of these quickly igniting coals is constantly increasing in New England, and a larger tonnage of this will be required this year than ever. A new free-burning white ash intermediate coal, called the "Bernice," is just introduced here. Heretofore, this coal has gone West, but a supply of 50,000 tons is said to be coming East this year and more next year, if it meets with the expected success.

By this time, a large bituminous tonnage has been contracted for. The trade is fully four weeks ahead of last year. In amount of tonnage placed, the Cumberland and Clearfield interests seem to keep about even, but the former appear, at present, to be getting the larger number of contracts. No dealer will give a contract price. Very low figures have been given, doubtless the lowest of the year, if there is to be any semblance of harmony between the Pennsylvania and Baltimore & Ohio railroads, to say nothing of a real agreement, which is said to have been made. A fair price for bituminous coal is $2.60 @$2.70 f. o. b. at Baltimore, and $2.75@$2.85 at Philadelphia.

Several good-sized contracts have been taken by the New River (Chesapeake & Ohio) coal agency, and it looks as if there would be a larger Eastern tonnage of that coal this year than last. Low prices are given on this coal. As for provincial culm, the outlook is not particularly promising in view of the low price for domestic coal. None of this coal is now coming along, and no price can be given.

Quite a number of mills in this vicinity have bought bituminous in place of broken coal, and it looks as if this departure would be quite general with the larger consumers. The difference is so wide that anthracite dealers are making no special competing effort. The price of broken coal is somewhat unsettled. Dealers say that, unless they come down $1 per ton and enter into competition, there is no use of making any material reduction from present prices.

Freights remain at previous low figures, with no very promising outlook for an advance. We quote:

New York, $1.05@$1.25 per ton; Philadelphia, $1.25@$1.35; Baltimore, $1.40; Georgetown, nominal, $1.75; Newport News, $1.25; Richmond, $1.35; Bay of Fundy, $1.60@$1.65; Cape Breton, $2.25.

Retail trade continues fairly active at steady figures. We quote:

| | |
|---|---|
| White ash, furnace, egg, and nut | $5.75 |
| " " stove | 6.00@6.25 |
| Red ash, egg | 6.25 |
| " " stove | 6.50 |
| Lorberry, egg and stove | 6.50@6.75 |
| Franklin, egg and stove | 7.00 |
| Lehigh, furnace, egg, and stove | 6.00@6.25 |
| " | 6.00 |

**New Orleans.** March 1.

[Specially reported by C. A. MILTENBERGER & Co.]

We have no change to report in quotations of coal since our last to you. The demand has been unusually good for February, being almost equal to that of the month previous, and considerably in excess of the consumption of February, 1883. The present demand comes principally from the river trade, the city family trade being almost over for the season. The sugar-planters will soon begin to lay in their stocks for next season's business, when an active demand for Pittsburg coal may be anticipated.

## STATISTICS OF COAL PRODUCTION.

*Belvidere-Delaware Railroad Report for the week ended March 1st:*

| | Week. | Year. 1884. | Year 1883. |
|---|---|---|---|
| Coal for shipment at Coal Port (Trenton) | | | 125 |
| Coal for shipment at South Amboy | 12 956 | 84,627 | 124,595 |
| Coal for distribution | 14,507 | 134,137 | 132,088 |
| Coal for company's use | 3,346 | 31,286 | 25,364 |
| Total | 30,809 | 250,050 | 282,172 |
| Increase | | | |
| Decrease | | 32,122 | |

**The Transportation of Coke** over the Pennsylvania Railroad for the week ended March 1st, and year from January 1st:

| Tons of 2000 pounds. | Week. | Year. |
|---|---|---|
| Gallitzen & Mountain (Alleghany Region) | 2,337 | 22,591 |
| West Penn. RR | 1,678 | 20,741 |
| Southwest Penn. RR | 37,525 | 360,035 |
| Penn. & Westmoreland Region, Pa. RR. | 4,044 | 34,228 |
| Monongahela, Penn. RR | 1,258 | 13,088 |
| Pittsburg Region, Pa. R.R. | 17 | 102 |
| Snow Shoe (Clearfield Region) | 385 | 4,153 |
| Total | 47,244 | 454,938 |

**The Production of Bituminous Coal** for the week ended March 1st was as follows:

Tons of 2000 pounds, unless otherwise designated.

| | Week. Tons. | Year Tons |
|---|---|---|
| *Cumberland Region, Md.* | | |
| Tons of 2240 lbs | 36,924 | 264,315 |
| *Barclay Region, Pa.* | | |
| Barclay RR., tons of 2240 lbs. | 4,868 | 60,025 |
| *Broad Top Region, Pa.* | | |
| Huntington & Broad Top RR., of 2240 lbs | 3,108 | 30,987 |
| East Broad Top | | |
| *Clearfield Region, Pa.* | | |
| Snow Shoe | 5,066 | 41,619 |
| Tyrone and Clearfield | 44,811 | 436,816 |
| *Alleghany Region, Pa.* | | |
| Gallitzen & Mountain | 8,705 | 79,628 |
| *Pittsburg Region, Pa.* | | |
| West Penn RR | 5,777 | 63,031 |
| Southwest Penn. RR | 2,228 | 27,558 |
| Pennsylvania RR. | 4,453 | 45,815 |
| *Westmoreland Region, Pa.* | | |
| Pennsylvania RR | 29,469 | 210,211 |
| *Monongahela Region, Pa.* | | |
| Pennsylvania RR | 3,688 | 28,787 |
| Total | 143,097 | 1,288,792 |

## FREIGHTS.

### Coastwise Freights.

*Per ton of 2240 lbs.*

Representing the latest actual charters to March 6th.

| PORTS. | From Philadelphia. | From Baltimore. | From Elizabethport, Port Johnston, South Amboy, Hoboken, and Weehawken. |
|---|---|---|---|
| Alexandria | | | |
| Annapolis | | | |
| Albany | | | |
| Baltimore | | | |
| Bangor | | | |
| Bath, Me | | 1.40 | |
| Beverly | | | |
| Boston, Mass | 1.45@1.50 | 1.40 | 1.10 |
| Bristol | | | |
| Bridgeport, Conn. | | 1.25 | |
| Brooklyn | | | |
| Cambridge, Mass. | | | |
| Cambridgeport | | | |
| Charleston, S. C. | .80 | | |
| Charlestown | | | |
| Chelsea | | | |
| City Point | | | |
| Com. Pt., Mass. | | | |
| E. Boston | | | |
| East Cambridge | | | |
| E. Gr'nwich, R. I. | | | |
| Fall River | | 1.25 | |
| Galveston | | | |
| Gardiner, Me | | | |
| Georgetown, D.C. | | | |
| Gloucester | | | |
| Hartford | | 2.00 | |
| Hackensack | | | |
| Hudson | | | |
| Lynn | | | |
| Marblehead | | | |
| Medford | | | |
| Millville, N. J. | | | |
| Milton | | | |
| Newark, N. J. | | 1.40 | |
| New Bedford | | 1.30 | |
| Newburyport | | 1.75 | |
| New Haven | | 1.25 | |
| New London | | 1.25 | |
| New-Berne | | | |
| Newport | | | |
| New York | | 1.15 | |
| Norfolk, Va | .80 | | |
| Norwich | | 1.40 | |
| Norwalk, Conn | | 1.30 | |
| Pawtucket | | 1.40 | |
| Philadelphia | | .75 | |
| Portland, Me | | 1.40 | |
| Portsmouth, Va. | .80 | | |
| Portsmouth, N.H. | | 1.50 | |
| Providence | | 1.25 | .80@.90 |
| Quincy Point | | | |
| Richmond, Va. | 1.00 | | |
| Rockland, Me | | | |
| Rockport | | | |
| Roxbury, Mass. | | | |
| Saco | | | |
| Sag Harbor | | | |
| Salem, Mass. | | 1.50 | |
| Saugus | | | |
| Savannah | | | |
| Somerset | | 1.30 | |
| Staten Island | | | |
| Trenton | | 1.00 | |
| Troy | | | |
| Wareham | | 1.40 | |
| Washington | | | |
| Weymouth | | | |
| Williamsbg, N.Y. | | | |
| Wilmington, Del. | | .75 | |
| Wilmington, N.C. | 1.00 | | |
| St. Thomas, W. I. | | | |

* And discharging. † And discharging and towing. ‡ 3c. per bridge extra. §Alongside. ‖ And towing up and down. ¶ And towing. ** Below bridge.

Comparative statement of the production of anthracite coal for the week ended March 1st, and year from January 1st:

| TONS OF 2240 LBS. | 1884. | | 1883. | |
|---|---|---|---|---|
| | Week. | Year. | Week. | Year. |
| *Wyoming Region.* | | | | |
| D. & H. Canal Co.. | 73,297 | 463,772 | 64,398 | 519,523 |
| D. L. & W. RR. Co. | 89,737 | 670,557 | 71,372 | 658,964 |
| Penna. Coal Co..... | 13,544 | 141,633 | 14,337 | 174,076 |
| L. V. RR. Co..... | 29,642 | 194,777 | 4,410 | 153,212 |
| P. & N. Y. RR. Co.. | 3,254 | 27,416 | 2,434 | 28,624 |
| C. RR. of N. J..... | * | * | 64,962 | 330,818 |
| North & West Br. RR..... | 14,199 | 130,801 | 9,608 | 83,074 |
| | 223,673 | 1,628,956 | 231,521 | 1,948,291 |
| *Lehigh Region.* | | | | |
| L. V. RR. Co..... | 71,975 | 616,483 | 70,629 | 664,606 |
| C. RR. of N. J..... | * | * | 61,454 | 300,174 |
| S. H. & W. B. RR.. | 3,164 | 31,198 | 170 | 2,362 |
| | 75,139 | 647,681 | 132,253 | 967,142 |
| *Schuylkill Region.* | | | | |
| P. & R. RR. Co..... | 155,372 | 1,380,850 | 110,980 | 935,415 |
| Shamokin & Lykens Val..... | * | * | 26,231 | 194,001 |
| | 155,372 | 1,380,850 | 137,211 | 1,129,416 |
| *Sullivan Region.* | | | | |
| St Line & Sul. RR. Co. | 1,492 | 12,627 | 757 | 9,714 |
| Total... ... .... | 455,676 | 3,670,114 | 501,742 | 4,054,563 |
| Increase..... | ..... | ..... | ..... | ... .. |
| Decrease..... | ..... | 384,449 | ..... | ..... |

* Included in tonnage of the Philadelphia & Reading Railroad.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

| | | |
|---|---|---|
| Total same time in 1879 | ..... | 3,395,082 tons. |
| " " " " 1880 | ..... | 3,273,493 " |
| " " " " 1881 | ..... | 4,040,960 " |
| " " " " 1882 | ..... | 3,739,839 " |

*The decrease in shipments of Cumberland Coal* over the Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 25,171 tons, as compared with the corresponding period in 1883.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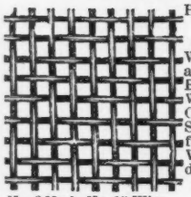

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# MAPS.

ARIZONA AND NEW MEXICO.—This map shows all the Township Surveys, Private Land Claims, Post-Offices, and Settlements. It also exhibits the Explorations of other Government and Private Expeditions, including the facts developed by the Surveys for the Routes of Projected Railroads, etc., 1881. Scale, one inch to thirty-three miles. Colored, 24×17 inches. Pocket form, $1.

COLORADO.—Topographical and Township Map of Part of the State, exhibiting the San Juan, Gunnison, and California Mining Regions. By Louis Nell. Substantially same as above. Post-offices, March 1st 1880. Scale, 1 inch : 9 miles, 1-570,240. Plain sheets for wall, 90 cents.

COLORADO.—Cannon's Map of the Mineral Belt of Colorado. Taken from the Records of the Surveyor-General's Office, and other reliable Official Sources. Showing, in colors, the Mineral Belt, Gold Districts, Silver Districts, Coal Districts, County Lines, and Boundaries of Land Districts. There are also given the Capital, County Seats, Township Lines, Railroads, and Projected Railroads. Scale, 1 inch : 10 miles. Size, 26×30 inches. Pocket form, $1.50; as a wall-map, $2.

# GOVERNMENT RAILWAYS

OF

## NEW SOUTH WALES.

### Contract for the Manufacture and Supply of 150,000 tons of Steel Rails.

### To Ironmasters, Manufacturers, and Others.

The Government of New South Wales being desirous of encouraging the development of the local Iron Mining and Iron and Steel Manufacturing Industries, are prepared to receive Tenders for the supply of 150,000 tons of Steel Rails, to be manufactured in the Colony.

Sealed Tenders, marked outside "Tenders for the Manufacture and Supply of 150,000 tons of Steel Rails," will be received at the office of the Agent General of New South Wales, Westminster Chambers, Queen Victoria street, London, E. C., not later than the 30th November, 1884, and at the Public Works Office, Sydney, not later than the 10th February, 1885, at which latter place the whole of the Tenders will be opened at 11 o'clock, A. M., on the day last named.

Each Tender must be accompanied by a Bank Deposit Receipt to the credit of the Commissioner for Railways in the sum of (£1000) one thousand pounds sterling, as a guarantee of good faith. Such deposit will be returned to the unsuccessful Tenderers as soon as the Tenders have been declared, but the deposit of the successful Tenderer will be retained as security for the due performance of the Contract. Tenders not accompanied by such deposit will be absolutely rejected as informal.

Printed copies of preliminary Specifications and Conditions of Contract may be obtained on application at the office of the Commissioner for Railways, Sydney, and also from the Agent General of New South Wales, Westminster Chambers, Queen Victoria street, London, E. C.

Delivery of the rails is to commence not later than 1st December, 1886, and to be at the rate of not less than 15,000 tons per annum.

Contractors must give full information and particulars in their Tender as to the process of manufacture they intend to adopt, and also whether they will be prepared to manufacture and supply, at rates to be afterward agreed upon, such points, crossings, fishplates, and fastenings, etc., as may be required from time to time for the rails under this Contract.

Contractors must state in their Tender whether they intend to manufacture the rails from native materials only, or whether, and to what extent, they intend to use imported material, giving a separate price per ton in each case.

As it is unlikely that intending Contractors will enter into an engagement of the above nature, without first satisfying themselves by personal inspection as to the position and extent of the raw material in New South Wales required for the manufacture of iron, every facility and information on this subject will be afforded on application to the Under Secretary of the Mines Department, Sydney, and free passes will be allowed on the Government Railways of New South Wales to representatives of Tenderers wishing to ascertain the resources of the Colony.

For the information of persons desiring to Tender, it may be stated that the official returns show that there were imported into New South Wales and Victoria (the two Colonies join each other, and are connected by Railway) within the last 10 years 1,250,000 tons of iron and steel inclusive of the permanent way material required for Government and other railways constructed during the period mentioned.

CHAS. A. GOODCHAP,
Commissioner for Railways.

*Department of Public Works,*
*Railway Branch,*
*Sydney, 1st October,* 1883.

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